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Vikram Rai[1] and Lena Suchanek[2]

[1]International Economic Analysis Department
[2]Canadian Economic Analysis Department
Bank of Canada
Ottawa, Ontario, Canada K1A 0G9
Corresponding author: raiv@bankofcanada.ca

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Abstract

The Federal Reserve's quantitative easing (QE) program has been accompanied by a flow of funds into emerging-market economies (EMEs) in search of higher returns. When Federal Reserve officials first mentioned an eventual slowdown and end of purchases under the central bank's QE program in May and June 2013, foreign investors started to withdraw some of these funds, leading to capital outflows, a drop in EME currencies and stock markets, and a rise in bond yields. Using an event-study approach, this paper estimates the impact of "Fed tapering" on EME financial markets and capital flows for 19 EMEs. Results suggest that EMEs with strong fundamentals (e.g., stronger growth and current account position, lower debt, and higher growth in business confidence and productivity), saw more favourable responses to Fed communications on tapering. Capital account openness initially played a role as well, but diminished in importance in subsequent tapering announcements.

JEL classification: C33, E58, F32, G14
Bank classification: International financial markets; Transmission of monetary policy; International topics

Résumé

Le programme d'assouplissement quantitatif mis en œuvre par la Réserve fédérale a entraîné un afflux de capitaux vers les économies de marché émergentes, à la faveur d'une quête de rendements. En mai et juin 2013, des représentants de la Réserve fédérale ont pour la première fois évoqué la possibilité de ralentir le rythme des achats d'actifs et de mettre fin au programme d'assouplissement quantitatif. Les investisseurs étrangers ont alors réagi à ces annonces en retirant une partie de leurs capitaux des économies de marché émergentes, ces sorties de fonds provoquant dans ces pays une dépréciation des monnaies, un recul des marchés boursiers et une hausse des rendements obligataires. À l'aide d'une étude événementielle, les auteurs estiment l'incidence de la réduction des achats d'actifs de la Réserve fédérale sur les marchés financiers de 19 économies émergentes ainsi que sur les flux de capitaux qui leur sont destinés. Les résultats donnent à penser que les répercussions des annonces concernant le ralentissement des achats d'actifs par la Fed ont été moins défavorables pour les économies émergentes aux facteurs fondamentaux solides (croissance forte, balance courante positive, dette publique faible, confiance et productivité accrues des entreprises, etc.). La libéralisation du compte de capital a aussi joué un rôle au début, mais l'importance de cet effet a diminué au fil des annonces.

Classification JEL : C33, E58, F32, G14
Classification de la Banque : Marchés financiers internationaux; Transmission de la politique monétaire; Questions internationales

1. Introduction

The U.S. Federal Reserve's (Fed) quantitative easing (QE) program has been accompanied by a flow of funds into emerging-market economies (EMEs) in search of higher returns. In May and June 2013, the Fed first mentioned that it could reduce the pace of monthly asset purchases ("tapering") under its QE3 program from US$85 billion per month later in 2013. In the December 2013 Federal Open Market Committee (FOMC) statement, the Fed announced its intention to begin tapering by US$10 billion per month, starting in January 2014. The Fed also signalled its intention to end the program around the middle of 2014. These events have led to an increase in U.S. government bond yields, and the relatively higher nominal yields in major developing markets attracted inflows.

Following these announcements, portfolio capital flows to EMEs slowed and even reversed (Chart 1), EME currencies trended weaker (Chart 2), stock markets fell (Chart 3), and domestic long-term interest rates rose (Chart 4). Initially, portfolio outflows from EMEs in May through June were broad based, but market pressures then became more concentrated on particular economies with important financial or macroeconomic vulnerabilities. Some of the losses were reversed upon the Federal Reserve's subsequent decision not to reduce the pace of purchases at that time (September 2013), but several vulnerable countries saw a renewed fall in risky assets upon the actual announcement of tapering in December.

This paper takes an event-study approach (using both individual-country and panel regressions) to estimate the impact of U.S. monetary policy on EME capital flows, exchange rates, stock markets and bond yields. While the existing literature has studied the response of emerging-market assets to U.S. monetary policy,[1] to our knowledge, there is limited empirical evidence on the impact of Fed tapering on EMEs (quite distinct from historical periods of U.S. monetary policy tightening), and on the hypothesis that fundamentals played a role in explaining the strength of the reaction.

There are two exceptions: Eichengreen and Gupta (2013) study the impact of Fed tapering on EME exchange rates, foreign reserves and equity prices between April 2013 and August 2013. The authors find that those hit hardest had relatively large and liquid financial markets, and had allowed large rises in their currency values and their trade deficits during the Fed's Large Scale Asset Purchases (LSAPs), whereas good macro fundamentals or capital controls did not provide much protection. Our study extends their results insofar as we also study the impact of Fed tapering on capital flows and bond yields, include the actual start of tapering (December 2013), and add additional explanatory variables. The second related paper, by Aizenman et al. (2014) also

[1] Cf. Andritzky, Bannisterb, and Tamirisab (2007); Arora and Cerisola (2001); and Maćkowiak (2007).

employs a panel framework using daily data, and finds that emerging-market asset prices responded most to statements by Fed Chairman Ben Bernanke, and much less to those by other Fed officials. Intriguingly, they find that countries with stronger fundamentals were more adversely exposed to tapering news than countries with weaker fundamentals.

Our results suggest that EMEs reacted strongly to the Federal Reserve's announcements and decision regarding the pace of its monthly asset purchases. That is, EME currencies depreciated and stock markets fell upon the mention of tapering in May and June 2013, as well as with the actual implementation of tapering in December 2013, while bond yields increased. Panel regression analysis including macroeconomic indicators further suggests that countries that are more vulnerable (i.e., countries with weaker growth and current account positions, higher debt, lower reserves, and weaker confidence and productivity growth) experienced sharper exchange rate depreciation and falls in stock markets, and a more pronounced reaction in capital flows in response to tapering announcements.

Our results are symmetrical: the same EMEs that saw a larger negative response to a surprise tightening of monetary policy in the June 19 FOMC also benefited from the surprise loosening of monetary policy in the Federal Reserve's September 18 FOMC announcement. We also find that capital account openness played a role only on the very first mention of tapering, but does not explain the variation in EME exchange rates, domestic stock market indexes, bond yields or portfolio flows for subsequent tapering announcements in 2013.

The paper is organized as follows: section 2 sets out the data and methodology. Section 3 elaborates on the results of country-by-country and panel regressions. Section 4 concludes.

2. Methodology

This section discusses the choice of an event-study approach; the type of event study applied, including the panel approach; the choice of event dates; and the data.

2.1. Event-study approach: caveats and related literature

Assessing the impact of tapering announcements on emerging-market capital flows and financial markets is complicated by many conceptual and empirical hurdles, especially those related to identification. For example, the impact of tapering announcements on capital flows may be difficult to gauge, owing to contemporaneous macro-policy initiatives in EMEs, such as exchange rate intervention, raising interest rates, and adjusting capital controls to hamper net outflows. All of these were implemented in response to the acceleration of capital outflows, complicating identification. Second, the impact of potential tapering by the Fed might not have been fully transmitted to EMEs yet, or further effects are to come once purchases eventually stop and are

even reversed. Thus, it may be too early to fully evaluate the effects of the reduction in U.S. monetary policy easing.

Keeping these caveats in mind, to identify the effect of tapering events empirically, we conduct an event study on movements in EME assets on "announcement dates," i.e., days when former Federal Reserve Chairman Ben Bernanke or the FOMC publicly announced the intention to end the current QE Program. The rationale for this approach is that forward-looking financial markets should quickly incorporate all information from a public announcement shortly after the announcement is made. Intuitively, financial markets would not be expected to forgo large, riskless, profitable trading opportunities for more than a few days or even hours, and thus the impact would be reflected in prices within a short period of time following the announcement. Another advantage of event-study analysis over lower-frequency regression is that by considering changes in financial asset prices in EMEs (exchange rates, stock markets, bond yields) across a ten-day window surrounding the announcement, and changes in capital flows across a five-week window, it can be argued that fundamentals beyond those associated with the announcement itself change very little.[2] Event studies would also appear to avoid endogeneity problems that can arise when using monthly or quarterly data, which can make estimating the effects of U.S. monetary policy on EME variables difficult. The approach thus addresses some of the caveats noted above (Kozicki, Santor and Suchanek 2011).

Previous studies have used the event-study approach to estimate the impact of announcements on asset prices, and on bond and currency markets. For example, Swanson (2010) uses an event-study analysis to estimate the impact of "Operation Twist," as well as the Federal Reserve's second QE program, on Treasury yields. Regarding the impact of U.S. unconventional monetary policy on EMEs, some papers have used an event-study approach to estimate the impact of QE announcements on EME capital flows and exchange rates (Fratzscher, Lo Duca and Straub, 2013[3]), while others have used a VECM approach (Chen et al. 2011). To our knowledge, the event-study approach has not yet been applied to estimate the impact of Fed tapering on EMEs.

Most of the literature on monetary policy surprises focuses on their effect on U.S. and European stock markets, as in Rigobon and Sack (2003) and Bernanke and Kuttner (2005). These papers usually construct some measure of the surprise element of central bank announcements, using

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[2] Swanson (2010) argues that this requires that no other major macroeconomic data surprises or announcements occur on the same day as the announcement. Swanson (2010) further notes that quarterly regression models have residual standard errors too large to detect small but statistically significant effects of announcements, even if the model is correctly specified and the size of those effects is correctly estimated.

[3] The authors find that QE1 triggered a portfolio rebalancing across countries out of emerging markets (EMEs) and into the United States, while QE2 triggered rebalancing in the opposite direction. Interestingly, they do not find evidence that foreign exchange or capital account policies helped countries shield themselves from spillovers – rather, heterogeneity in the responses to Fed policies is related to country risk.

federal funds rate futures or Eurodollar futures. These studies also account for the fact that U.S. and European stock markets may directly enter the Federal Reserve's policy reaction function, or may have a substantial effect on growth or inflation and thus be endogenous to monetary policy surprises. However, our research does not need to account for such issues, since emerging-market variables are unlikely to be endogenous to the Federal Reserve's policy reaction function, unlike in the above studies.[4] This likely makes identification easier in our regression, where dependent variables are emerging-market variables. Second, it is generally agreed that the Federal Reserve's announcements on tapering were widely unexpected by markets; thus, we do not have to empirically identify monetary policy surprises and can simply include dummy variables for announcement dates.

2.2. Event dates

We measure the impact of QE tapering on EMEs using days when either Ben Bernanke or the FOMC as a whole indicated possible future tapering. This approach to identifying tapering announcements is qualitative, given that there have been few announcements and that the presence of Federal Reserve communication on tapering is unambiguous. Where required, we adjust the event dates forward by one day for EMEs located in time zones where markets would have been closed at the time of the announcement.

1. **May 22, 2013**: As the labor market improved and fiscal restraint hit the U.S. economy less than expected, the Fed first considered a tempering of purchases during a question-and-answer session following its testimony to the congressional Joint Economic Committee. Bernanke explained that "if we see continued improvement and we have confidence that that's going to be sustained then we could *in the next few meetings ... take a step down* in our pace of purchases..." (emphasis added).
2. **June 19, 2013**: The anticipation of a reduction of purchases in 2013 was further reinforced during the following FOMC meeting, where Bernanke said that "The committee currently anticipates that it will be *appropriate to moderate the monthly pace of purchases later this year*" (emphasis added). He further added that "if the subsequent data remain broadly aligned with our current expectations for the economy, we will continue to reduce the pace of purchases in measured steps through the first half of next year, ending purchases around mid-year."

[4] In fact, market observers generally agree that the Fed considers domestic conditions (rather than also considering the response of EMEs) in its decision to taper asset purchases. One could argue that an endogeneity problem still arises if EMEs have a larger effect on U.S. economic activity. This does complicate our approach; but, given that the share of U.S. trade with EMEs is still relatively small compared with the share of its trade with other advanced economies and the negative response we find is mainly in EMEs that represent a fairly small share of world GDP (i.e., mainly EMEs excluding China and Russia), we believe this complication should be limited.

For simplicity, we refer to the latter two events as "the taper events."[5]

3. **September 18, 2013**: Financial markets widely anticipated the beginning of tapering at the next FOMC meeting, but the FOMC surprised markets by not reducing the pace of purchases, citing concerns about the impact of higher interest rates on the economy, particularly of mortgage rates on housing.

For simplicity, we refer to the latter date as the "non-taper event."

4. **December 18, 2013**: In its FOMC meeting, the Fed announced plans to cut its monthly bond purchases to $75 billion from $85 billion.[6]

We will call this the "actual tapering decision. "

2.3. Data

The dependent variables we study include daily data, which appear to better capture the reaction of markets to news, rather than intraday data (Payne 2003):

- nominal US$/LCU exchange rates (from Bloomberg)
- domestic stock markets (from national sources via Haver Analytics – see Appendix B for details)
- 10-year government bond yields (from Bloomberg)

We also use weekly capital flows data from EPFR.[7] Our sample covers 19 EMEs: Brazil, Chile, Colombia, Czech Republic, China, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand and Turkey.

Our explanatory variables include *global variables* and *country-specific variables*.

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[5] No particular announcements were made during Bernanke's testimony (*Semiannual Monetary Policy Report to the Congress*, July 17, 2013), nor at the FOMC meeting on July 31. We do check these dates (not shown), and while we find fewer significant results, the results that are significant are consistent with the results for the four event dates we study.

[6] Note that the Fed also "enhanced" its guidance regarding the policy rate in the same statement, stating that it "likely will be appropriate to maintain the current target range for the federal funds rate *well past the time that the unemployment rate declines below 6-1/2 percent*." Unfortunately our methodology cannot distinguish the separate impact of these two announcements.

[7] EPFR data track net capital inflows. The EPFR data cover flows related to mutual funds, ETFs, closed-end funds and variable annuity funds/insurance-linked funds, but exclude other flows such as hedge funds, individual investors, proprietary trading desks of investment banks, insurance companies and other private investor flows. However, EPFR flows still track overall flows relatively well in most cases and are being increasingly used in academic research on capital flows.

- The *global variables* included are global stock market returns, as measured by the FTSE Global All Cap (from the *Financial Times*) and global bond market returns, as measured by the JP Morgan Global Aggregate Bond Index (from Bloomberg), both in U.S. dollars.
- *Country-specific* variables are selected on the basis that i) they relate to a country's ability to meet its short-term financing needs, either public or private; ii) they are macroeconomic fundamentals; or iii) they provide information on how large or liquid a country's assets may be. These groups are given below. All country-specific variables are entered with a lag of one period.

i) *Macroeconomic fundamental variables:*

- real GDP growth rates (annual);
- headline inflation (monthly);
- labor productivity (output per worker, where available, quarterly);
- business confidence (survey-based, annual); and
- output gap (% of GPD, where available - annual).

ii) *Variables related to a country's ability to meet its financing needs:*

- principal repayments on external long-term debt, as a proxy for long-term debt, as a share of GDP; and
- current account balance as a share of GDP (annual and quarterly).

iii) *Variables reflecting market size, liquidity or openness (ease of selling assets):*

- Chinn-Ito financial openness index;
- nominal GDP (US$, annual); and
- nominal current account balance (US$, quarterly).

The data sources for the country-specific variables are given in Appendix B, Table B-1.

2.4. Empirical model

We start by simply plotting the cumulative 5-day change in EME currencies, stock-price indices, and government bond yields (Chart 6). It is evident that, across the board, currencies depreciated, stock prices declined and government bond yields rose, as foreign investors withdrew liquidity from EMEs. To address the question empirically, we apply an event study using dummy variable regressions.

The impact of an event is estimated as the coefficient of a dummy variable that corresponds to a specific event date (including both country-by-country as well as panel regressions). We use

country-by-country regressions in the form of Equation (1) where, starting 1 January 2013 and ending 21 January 2014 (approximately 30 days after the last event date):

$$R_t = \alpha + \beta_1 Z_t + \beta_2 X_t + \varepsilon_t, \qquad (1)$$

- R_t is the return on the variable of interest, proxied by the log difference of exchange rates, domestic stock markets, weekly net portfolio inflows, or the first difference of bond yields;
- Z_t is a vector of dummy variables for each of 4 announcement dates; each variable takes the value of 1 on its event date and is 0 on all other dates;[8]
- X_t is a vector of global variables described in the previous section: global stock and bond market turns; and
- ε_t is a robust standard error. For the period studied, the residuals are well behaved and exhibit no signs of serial autocorrelation or ARCH/GARCH errors.

This approach simply estimates whether the return increased or decreased in a statistically significant way on days of announcements. When including explanatory variablesX_t, the results indicate whether the return increased or decreased in a statistically significant way above and beyond the component of its return that is typically correlated with global markets.[9]

The model in Equation (1) can be extended to a panel setting, which allows us to take advantage of the heterogeneity of countries and determine which macroeconomic characteristics of the countries in the sample are related to their reaction to tapering announcements (such as in Ehrmann and Fratzscher 2004, 2009). While Equation (1) involves separate country-level regressions for each country *i*, this approach pools all countries in the sample and includes country fixed effects[10]:

$$R_{it} = \beta_1 Z_{it} + \beta_2 Z_{it} S_{it} + \beta_3 S_{it} + \beta_4 X_t + \varepsilon_{it} + \eta_i \qquad (2)$$

In Equation 2, X_t and Z_{it} are unchanged (except that Z is now country-specific to account for time zone differences). S_{it} refers to country-specific characteristics, which can be time varying at any frequency (such as GDP, inflation and current account balances), or time invariant. In the case

[8] Note that we adjust dummy variables for EMEs in different time zones, since FOMC statements (released at 2 p.m. on Wednesdays) would not affect these countries' stock and bond markets in the same calendar day as they are closed at that time. Our exchange rate data are from Bloomberg, which reports the closing price of trades occurring through New York, so they are not adjusted for time zone differences.

[9] Regressions also include dummies for Mondays and Fridays, which is standard in the finance literature to control for differences in liquidity and trading because traders tend to close positions on Fridays and open them on Mondays. Dummies are excluded whenever they are not statistically significant.

[10] We check that individual country effects exist and apply a Hausman test to confirm that fixed effects are appropriate for this data, and test for parameter constancy as well. Parameter constancy holds strongly when the variable included in *Z* is significant, and almost always holds when *Z* is insignificant as well. We limit the panel regressions to the data beginning on January 1, 2013 ending on January 21, 2014 to avoid a high risk of a Type II error from too long a time period.

where it is time invariant, the level effect of S_{it}, i.e., B_3, is not identified. Because different country-characteristics are likely related to each other, we avoid potential simultaneity bias by including only one variable at a time inS_{it} and use lagged values of S_{it}.[11]

Additionally, in this model, we find evidence of first-order autocorrelation (from a Wooldridge test) and heteroskadasticity (from a likelihood-ratio test) in the panel standard errors, so we use panel-corrected standard errors, specifying that the standard errors are heteroskedastic and contemporaneously correlated across panels, and that ε_{it} follows an AR(1) process specific to each country.

3. Results

This section reports 1) the results of separate dummy variable regressions for four different EME variables (exchange rates, stock markets, bond yields and capital flows) for all 19 EMEs in the sample; and 2) results for panel regressions.

3.1. Country-specific dummy variable regressions

Using **EME exchange rates** as the dependent variable, almost all of the estimated dummy variable coefficients are statistically significant and have the expected sign: emerging-market currencies depreciated on tapering events (May 22, June 19), and again on the actual taper event (December 18) (Table 1). Interestingly, the impact on June 19 is estimated to be larger than on the first mention of tapering on May 22 – this is likely related to the fact that markets took more than one day to incorporate the news. The full impact is thus not captured by the dummy variable, an issue which is resolved in the abnormal regression returns below. Also, the largest reaction is seen on June 19, while the actual tapering decision only caused small movements in exchange rates. This suggests that markets had anticipated the Fed's move and thus had already incorporated the impact of tapering in December. In contrast, currencies appreciated on the non-taper event as markets were surprised by the continuation of monthly purchases at the same rate, implying more global liquidity. To get a sense of the size of the estimated coefficients, Table 5 reports the estimated coefficients relative to the standard deviation of the dependent variable[12]: in many cases, the depreciation was relatively large, i.e. 2 or 3 times the standard deviation of daily exchange rate returns.

It appears that vulnerable countries, including South Africa and Indonesia, have seen a larger reaction than resilient countries, a hypothesis we will describe in more detail below. Results are

[11] This approach is similar to the one adopted in Eichengreen and Gupta (2013).
[12] Standard deviations are calculated over the 2010-01-01 to 2014-01-21 period.

symmetric: countries with a large depreciation upon the second tapering announcement also saw their currencies rebound more on the "non-taper" event.

Similarly, EME **stock markets** fell in all instances on July 19 in a statistically significant way (Table 2). No clear pattern emerges for May 22, with many indexes increasing, but only by relatively little, likely related to the fact that the reaction took more than one day to be incorporated. Almost all stock markets rebounded upon the non-taper event in September. Again, while the reaction to the actual tapering announcement is somewhat smaller, coefficients are statistically significant and have the expected sign in almost all cases. Vulnerable countries such as Turkey, Indonesia and South Africa saw a statistically significant fall in stock markets on June 19, but their stock markets also saw a large rebound on the non-taper event. Compared with stock market indexes' standard deviation (Table 5), several reactions are large (on average, indexes fell by an amount that was twice their standard deviation on June 19).

As for **bond markets**, several reactions in bond market yields (10-year) are statistically significant, and mostly in line with expectations.[13] Yields increased on the second tapering announcement in June in 14 out of 15 statistically significant responses (Table 3) as investors withdrew liquidity from bond markets. For the non-taper event, most bond yields receded, consistent with expectations. In terms of standard deviation, reactions were relatively large on the June 19 event (on average more than twice their standard deviation, Table 5). Results for May 22 and the actual taper in December are less clear.

Fewer coefficients in the regression of **capital flows** are statistically significant. Whereas it is relatively easy and fast for investors to withdraw currency and stock market assets, the full reaction in capital flows might not have occurred immediately, but gradually over the weeks following the announcement, as is evident in Charts 1 and 5. The dummy variable regression might thus not pick up the full extent of the impact, since it only considers the reaction of capital flows within the week of the announcement. Nevertheless, statistically significant results are mostly as expected: capital flows turned negative on the actual tapering announcement for many countries (Table 4). Coefficients are smaller than for other dependent variables when compared with the variable's standard deviation. Results are less clear for the other tapering events.

To summarize, financial markets in EMEs reacted importantly to Fed announcements regarding the pace of purchases under its QE program. Compared with the first mention of tapering (May 22), the impact became more widespread upon the second event (June 19). Overall, stock markets and currencies fell, while bond yields increased, suggesting increased pressure on EMEs as

[13] We also estimate the impact on 1-year and 3-month bond yields, but find fewer statistically significant results. Indeed, it is intuitive that long-term bond yields react more importantly to tapering announcements, since they reflect expectations about future U.S. monetary policy.

international investors withdrew liquidity from EME assets. The reaction to the actual announcement of tapering (December 18), albeit carrying the expected sign, was relatively smaller, suggesting that markets had anticipated the announcement and already incorporated the information prior to the actual event. Vulnerable countries saw a larger reaction in their currencies, stock and bond markets and, to a lesser degree, capital flows. Finally, the results are symmetric, where larger falls in currencies and stock markets on June 19 are matched with larger rebounds on the non-taper event (September 18).

3.2. Robustness of dummy variable regressions

As mentioned in Section 3.1, one might want to include other explanatory variables in the regression to better capture the correlation of emerging-market variables with global financial variables. Excluding global stock market returns and a global bond market variable changes the results quantitatively, but not qualitatively. The size of the coefficients is, in most cases, larger (not shown), while the fit of the regressions (R^2) decreases. The basic conclusions hold: Almost all of the estimated dummy variable coefficients using EME **exchange rates** as dependent variables are statistically significant and have the expected sign. Currencies depreciated strongly on June 19, and in most cases, albeit less, on May 22. Almost all currencies rebounded on the non-taper event and fell again in December.

The same applies to **stock market indexes**, which fell in all instances on July 19 in a statistically significant manner. Almost all EME stock indexes rebounded on the non-taper event, whereas evidence for the December event is mixed. As for **bond markets**, almost all bond market yields increased upon the first and second events, and receded on the non-taper event, consistent with expectations. Bond market responses to the December announcement are more mixed. **Capital flows** turned negative upon the first tapering announcement. Vulnerable countries (Indonesia, India, South Africa) saw larger outflows. Subsequent announcements also affected capital flows, but less so. We are not able to determine whether this is because the initial reversal of flows fully captured the expectation of Fed tapering, or because of country-specific factors (such as policy changes following the first event, which made EMEs more resilient to subsequent events).

In addition, Appendix A shows the results of an abnormal return model, which provides further country-level evidence that the currencies of some of the same countries that appear in these regressions, such as Brazil, depreciated more than those of other EMEs.

3.3. Panel estimation: including macroeconomic interaction terms

The coefficients estimated in the dummy variable regression suggest that country characteristics might explain why some countries reacted more strongly than others. To explore this hypothesis,

we estimate the model described in Equation (2), which includes dummy variables for our event dates, and interaction terms between those event dates and country-specific characteristics.

3.3.1. Dependent variable: exchange rates

In all panel regressions, i.e., no matter which macroeconomic variable is included, almost all the tapering dummies carry a statistically significant and negative coefficient, suggesting that currencies depreciated on the May 22, June 19 and December 18 events (Table 6). On the contrary, however, in response to the non-taper, currencies appreciated, supporting our previous results from the individual country regressions. Turning to the interaction terms, while not all are statistically significant, coefficients are mostly supportive of the hypothesis that country characteristics mattered to explain the size in the reaction of currencies.[14]

To facilitate the presentation of our results, we provide the following matrix, which indicates the sign on each interaction term that would be consistent with the hypothesis that EMEs with weaker fundamentals saw a larger reaction to tapering announcements.

	May 22	June FOMC	Sept FOMC	Dec FOMC
Real GDP growth	+	+	-	+
Inflation	-	-	+	-
Productivity	+	+	-	+
Business confidence	+	+	-	+
Output gap	+	+	-	+
External debt	-	-	+	-
Current account balance (% GDP)	+	+	-	+
Financial openness	-	-	+	-
GDP level	+	+	-	+
Current account balance (levels)	+	+	-	+

[14] Note that we generally use lags because information about the country that is publicly available at the moment of the event is likely to be more important.

With respect to each row, in turn, Table 6 shows that:

- The coefficients on **real GDP growth** are significant for the May and June events, and consistent with our hypothesis. The same is true for **business confidence**.
- Likewise, **inflation** shows signs consistent with our hypothesis, and is significant for the event in September.
- **Productivity** interacts significantly and is consistent with our hypothesis on the June event.
- The signs of the coefficients on **financial openness** (the Chinn-Ito index) are consistent with our hypothesis, but there is only a significant relationship for the June event. This may suggest that financial openness initially played a role, but diminished through each subsequent episode as expectations gradually aligned with the FOMC's policy or EMEs improved their policies.
- The signs of the interaction terms on the **current account balance** are consistent with our hypothesis, and are significant for the June and September FOMC statements.
- **External debt** also shows signs consistent with our hypothesis, and is significant for the first event in May.

Finally, we note that, for exchange rates and the other dependent variables in the following sections, we find results that are both more significant and larger in magnitude for the June event than the May event.

We caution against interpreting this result as an indication that there was no reaction to the May event; rather, it appears that EME financial market variables took quite a bit longer to respond to the May event than to the June and September events. This is confirmed by our descriptive statistics. One possible explanation is that markets were completely surprised by the Fed's first mention of a future tapering in May. Contrary to the anticipation of news in the following events, the May event was unexpected and might thus have taken more time to affect market prices as investors evaluated the consequences of the statement.

Charts 1 through 4 show that, on average, there were considerable declines (or rises, for bond yields) between May 22 and June 19 for all of the dependent variables, larger than we see graphically in the period following June 19. For example, exchange rates had declined, on average, by around seven per cent between May 19 and June 21 (unweighted average).

In contrast, Chart 5 shows that, for just a 5-day window following each event (larger still than the 1-day window in our panel regression), the magnitude of change is larger (in many cases, twice as large or more) for the June event than the May event, for all dependent variables studied except portfolio flows. For example, the largest decline five days after the May event (excluding China) is Peru, with only a 1.4 per cent decline. In contrast, Poland had depreciated nearly four per cent in

the five days after the June event, and Peru, which is about the median depreciation five days after the June event, had declined by around 1.5 per cent.

In our robustness checks (following the remaining panel results), we relate the cumulative change over this period to the same variables that explain the heterogeneity in country responses on announcement dates. This suggests that the additional declines between the event dates may also be driven by country-specific factors.

3.3.2. Dependent variable: domestic stock market returns

Just as for exchange rates, the matrix in the previous section describes our expectations for the sign of the interaction terms when the dependent variable is domestic stock market indexes. The full results are given in Table 7. Briefly:

- **Financial openness** (the Chinn-Ito index) is not significant for any event date. The same is true for **external debt**, **inflation** (monthly), **real GDP growth**, **business confidence** and any of our macroeconomic variables that enter the regression in levels.
- Only the **output gap** and the **current account balance** are significant, respectively, for the May and June events. Both coefficients are consistent with our hypothesis (Table 7).

While results are less clear for domestic stock market returns, in part because exchange rate depreciation may itself have provided some cushion to export-oriented companies, they provide some evidence and are consistent with the more numerous results we find for exchange rates.

3.3.3. Dependent variable: government bond yields

For long-term government bond yields (10-year zero-coupon), we find somewhat more results than we do for domestic stock market returns. These results are all reported in Table 8.

- The coefficient on the **current account balance** is significant for the June event, and its sign is consistent with our hypothesis for all events. The same is true for **external debt** and **real GDP growth**.
- Other variables are not significant, although the signs are consistent with our hypothesis.

These results are consistent with theory, which suggests that movements in bond yields should be explained by variables that affect a country's' ability to finance its debt (public or private). All three of the country-specific variables that are significant for what we believe a priori to be a negative surprise in the June event are related to a country's ability to sustain its borrowing. This may also reflect an increasing exchange rate risk premium.

3.3.4. Dependent variable: portfolio flows

We also estimate the same model in Equation (2) for portfolio flows, which are weekly data. Our findings are comparable with those for exchange rates (Table 9):

- **Real GDP growth** is significant for the December event, and all signs are consistent with theory.
- **Inflation** is not significant, although the signs are consistent with theory. **Current account balance** shows signs consistent with theory and the interaction term is significant for the June event (as was the case for exchange rates). The same is true for **external debt**, **inflation**, **productivity**, the **output gap** and **financial openness** (the Chinn-Ito index).
- **Business confidence**, like the variables listed above, is significant for the June event and signs are all consistent with theory, and it is also significant for the December event.
- The levels of **GDP** and the **current account balance** are significant, respectively, for the May and June events (both reacting negatively to the surprise a priori), suggesting that the size of the countries also played some role in determining the relative change in portfolio flows.

Overall, we find considerable evidence that country characteristics explain some of the reaction by EMEs to tapering announcements.

3.3.5. Robustness of panel regressions and cross-section regressions

The results from the panel regression using fixed effects reported above are robust to a number of specifications. First, results are robust to the inclusion of global stock and bond market returns (as measured by the FTSE Global All Cap Index and the JP Morgan Global Aggregate Bond Index) as explanatory variables. Global market returns generally reduce the size of the coefficients on the interaction event dummy terms, but not their significance.

Second, specific to the regression of exchange rates, we also estimate a two-way fixed-effects model, including both country fixed effects and fixed effects for exchange rate regimes.[15] Accounting for exchange rate regimes does not affect the significance of the interaction terms. As well, interacting event dates, macroeconomic variables and exchange rates do not weaken the significance of our results.

Third, in our preferred specification (reported) we use panel-corrected standard errors, which best fit the data. Using alternative specifications for our residuals, including robust and bootstrapped errors, generally yields similar results in quality.

[15] The classification we use for exchange rate regimes is based on the 2011 IMF AREARS and is as follows: Floating – Brazil, Colombia, Hungary, India, Indonesia, Korea, Philippines, Poland, Thailand, Turkey, Peru, Russia, South Africa; free floating –Chile, Mexico, Czech Republic. Crawl-like arrangement: China, Taiwan; other –Malaysia (note that since Malaysia is the only country in this group, this exchange rate effect drops out of the regression).

Fourth, we follow Eichengreen and Gupta (2013) in regressing the cumulative change in exchange rates over the horizon of "tapering talk" (May 21–August 30) on a set of macroeconomic fundamentals in a cross-section analysis (Table 10). Similar to the above authors, we include financial openness as a control variable in all regressions.[16] The current account again enters with a statistically significant coefficient, indicating that countries with a stronger balance experienced less depreciation. Similar to the authors, we also find a statistically significant link to inflation, suggesting that countries with higher inflation saw a larger depreciation. Other variables are not statistically significant, however. Last, the financial openness variable is significant in most specifications, but positive, which would imply that financially open countries experienced less depreciation, the opposite of Eichengreen and Gupta's (2013) results. This may occur because we use the Chinn-Ito index, a measure of de jure openness, while Eichengreen and Gupta (2013) use a de facto measure of openness.

As an additional robustness check, we use a second type of event study, i.e., abnormal return regressions, to estimate the impact of tapering events on the respective EME dependent variables. The methodology and results are described in Appendix A. This model is difficult to specify, for two reasons: (a) it is not best suited to study a global event, where there is no benchmark that may be unaffected by the event that can be used to estimate a normal return; and (b) the requirement that exchange rates follow a multivariate normal distribution may not hold. Nevertheless, we find some evidence that some EMEs experienced negative abnormal returns following tapering announcements.

Last, we run a panel for advanced countries (including Canada, Australia, the euro area as a whole, the United Kingdom and Japan) to see whether the impact felt by EMEs was unique to EMEs, or simply related to increased global contagion. Few tapering dummy variables are statistically significant, implying that advanced countries were relatively unaffected by tapering announcements. Some positive impact upon the actual taper for stock markets is observed, and is likely explained by the typical correlation of advanced economies' stock market returns with U.S. returns. Similarly, bond yields increased upon both the first mention of tapering and the actual taper in some specifications. Interaction terms are not statistically significant, with the exception of inflation: countries with higher inflation did see a depreciation and fall in their stock markets on tapering announcements. There may be a useful avenue for further work in explaining why the current account position appears to have the strongest relation to EME responses, while for advanced economies, inflation rates are the most important.

[16] Note, however, that we use the Chinn and Ito (2008) index, rather than the size of financial market as measured by total external private financing.

4. Conclusions

Using an event-study methodology, this paper finds that EMEs reacted to the Federal Reserve's communications about reducing the pace of its monthly purchases ("tapering") under its quantitative easing program. In particular, currencies depreciated, stock markets fell, bond yields rose and portfolio flows slowed or turned negative. Conversely, these same variables rebounded on the Fed's decision to delay a tapering in September 2013. Results are symmetrical: the same EMEs that saw a larger negative response to the surprise tightening of monetary policy on the June 19 FOMC announcement also benefited most from the Federal Reserve's unexpected decision to delay tapering in September. The reaction to the actual announcement of tapering in December 2013 was rather muted, as markets had expected the announcement and it included a strengthening of the FOMC's forward guidance.

We further include macroeconomic variables in panel regressions to explain why some countries saw a sharper reaction to Fed monetary policy decisions than others. We find evidence that countries that are more vulnerable (i.e., countries with weaker growth and current account positions, higher debt, and lower foreign exchange reserves) experienced a sharper fall in exchange rates. The size of the reaction of stock market returns and portfolio flows to tapering announcements can also partly be explained by differences in country fundamentals. We also find that capital account openness played a role in earlier surprises, but diminished in importance in subsequent events.

The analysis has some caveats: first, the event-study analysis does not take into account policies implemented by EMEs in reaction to Fed tapering, likely having an impact on dependent variables. Indeed, several EMEs intervened in currencies, raised interest rates, or implemented other temporary measures to counter the impact of Fed tapering on their financial markets, often within days or weeks of the announcement days.[17] While dummy variable regression results would not be affected as long as the policy was not implemented the same day, abnormal return regressions could partially be biased due to the omission of a control for such policies.[18] Second, we do not measure the size of the surprise of tapering, or compare it with QE announcements or conventional monetary policy surprises.

Several extensions should thus be considered in future work. First, it would be interesting to estimate the size of the surprise of tapering, rather than using event dummy variables. In particular, one may construct a measure of the surprise element of central bank announcements

[17] For instance, Turkey intervened heavily in exchange markets to support the currency following the mention of tapering in June 2013. Similarly, the Reserve Bank of India probably sold dollars in June 2013 to prevent the rupee from sliding. Other countries raised interest rates to defend the currency (including India, Indonesia and Brazil).

[18] Note, however, that if policy measures were implemented between the announcement dates we studied, and these measures effectively improved a country's fundamentals, this would also reduce the magnitude of our coefficients for subsequent events.

using the increase in the volatility of long-term U.S. interest rates following Federal Reserve announcements (cf. Nakamura and Steinsson 2013). This approach would have the advantage of empirically identifying which announcements are surprises, rather than assigning surprise dates qualitatively, and quantifying the size of the surprise. This methodology would also allow for comparisons of the size of the reaction in EME financial markets with announcements related to QE, as well as with conventional monetary policy, and also permit the inclusion of many more observations to the estimation (e.g. including the release of minutes, speeches, etc.). Finally, one caveat about event studies is that they cannot estimate the duration impact of tapering announcements. Whether tapering had a permanent impact on EME variables is beyond the scope of our research, but would be worthwhile to address through alternative models (e.g., a SVAR) in future research.

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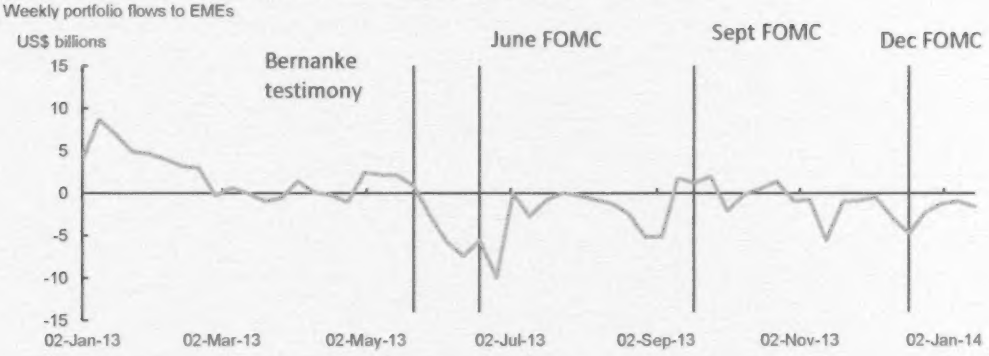
Charts

Chart 1

Capital flows to EMEs reversed on early tapering announcements

Weekly portfolio flows to EMEs



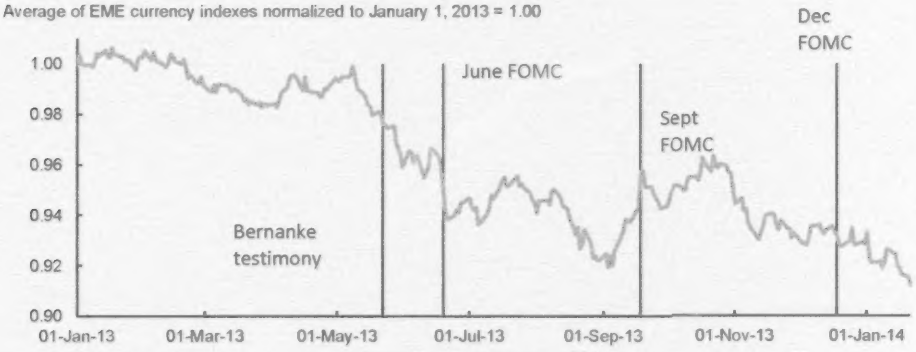
Note: Includes bond and equity flows to Brazil, Chile, China, Czech Republic, Colombia, India, Indonesia, Korea, Malaysia Mexico, Peru, Philippines, Poland, Russia, Taiwan, Thailand, Turkey and South Africa
Source: EPFR

Last observation: 15-01-2014

Chart 2

EME currencies depreciated on tapering announcements

Average of EME currency indexes normalized to January 1, 2013 = 1.00



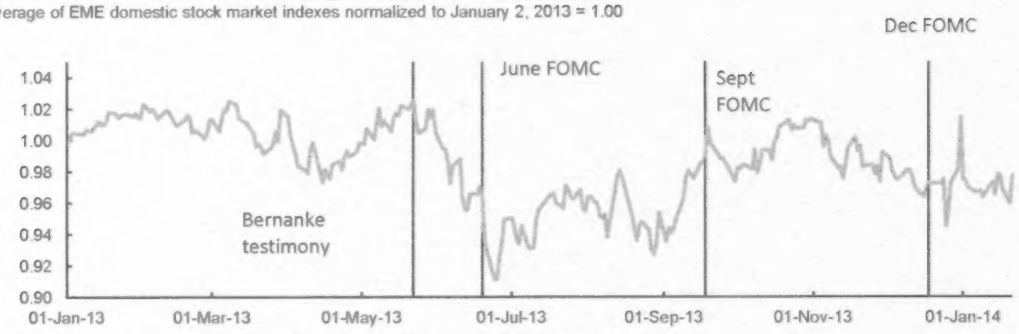
Note: Includes simple average of Brazil, China, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Taiwan, Thailand, Turkey and South Africa
Sources: Bloomberg and Bank of Canada calculations

Last observation: 21-01-2014

Chart 3

EME stock markets fell on tapering announcements

Average of EME domestic stock market indexes normalized to January 2, 2013 = 1.00



Note: Includes simple average of Brazil, China, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Taiwan, Thailand, Turkey and South Africa

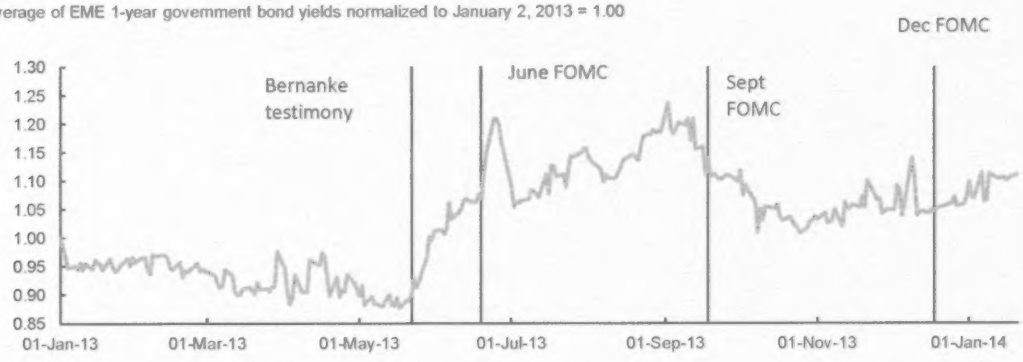
Sources: Bloomberg and Bank of Canada calculations

Last observation: 21-01-2014

Chart 4

EME bond yields rose on initial tapering announcements

Average of EME 1-year government bond yields normalized to January 2, 2013 = 1.00

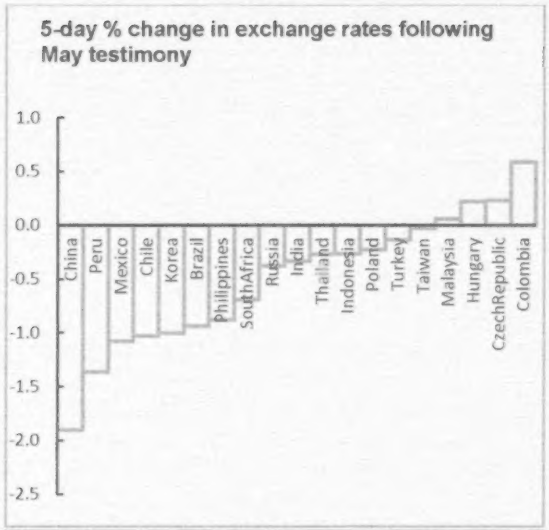


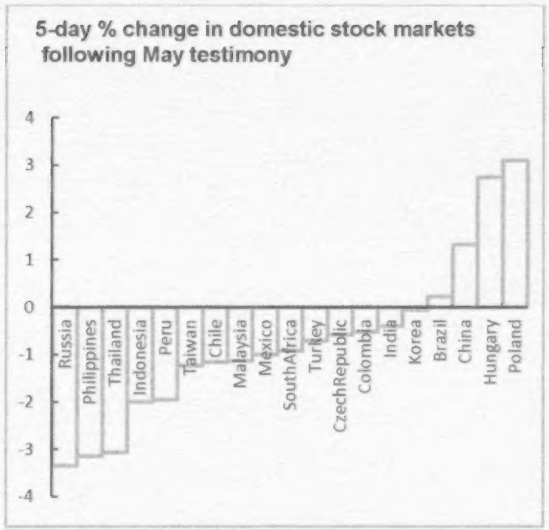
Note: Includes simple average of Brazil, China, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Taiwan, Thailand, Turkey, and South Africa.

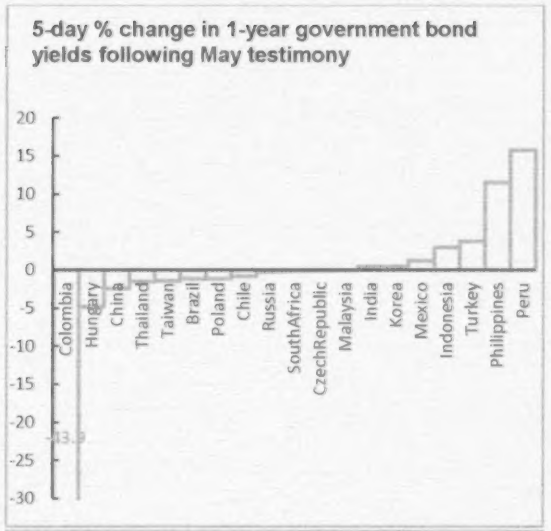
Sources: Bloomberg and Bank of Canada calculations

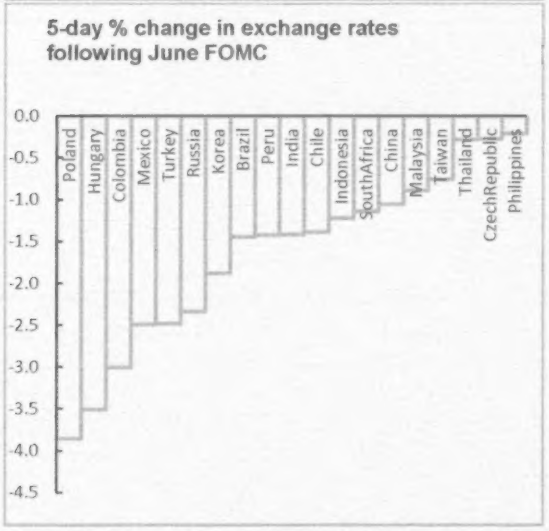
Last observation: 21-01-2014

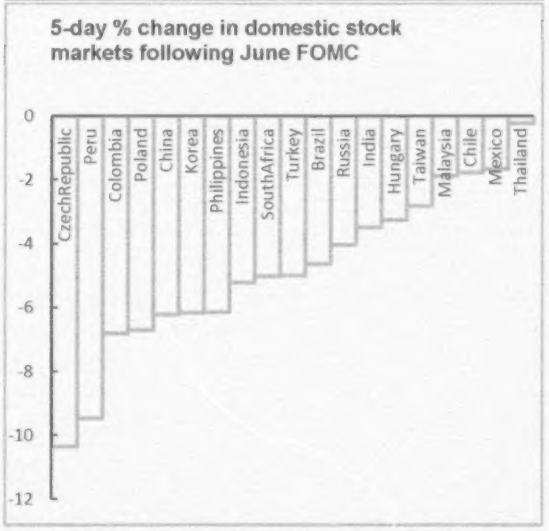
Chart 5: Event Study: Cumulative 5-day changes in selected variables following tapering announcements

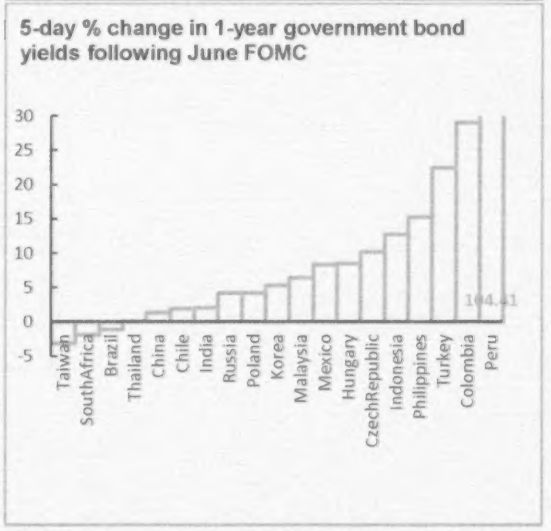








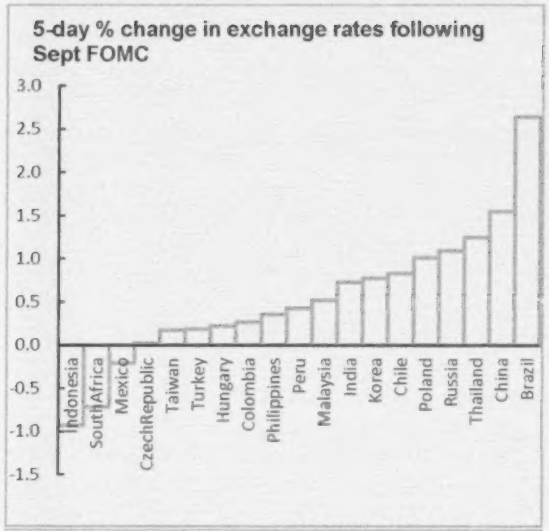


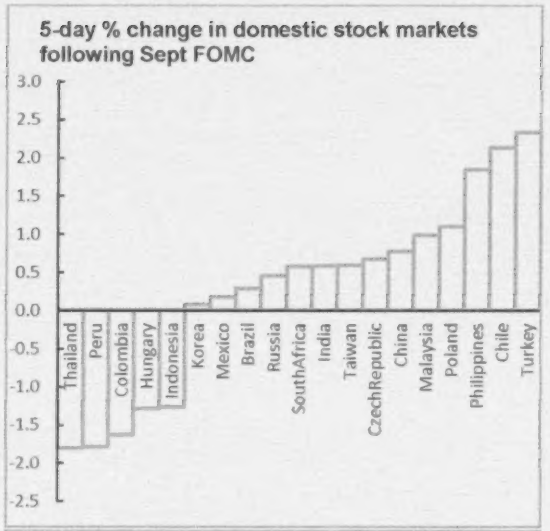


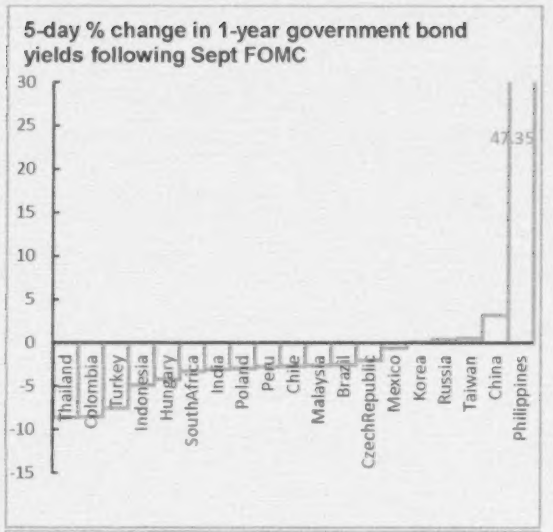
Note: Bars represent percentage change in the underlying variable between market close the day before the event in question and market close on the fifth weekday after the day of the event. Red numbers are extreme values that cannot clearly fit onto the chart on the same axis and remain readable.

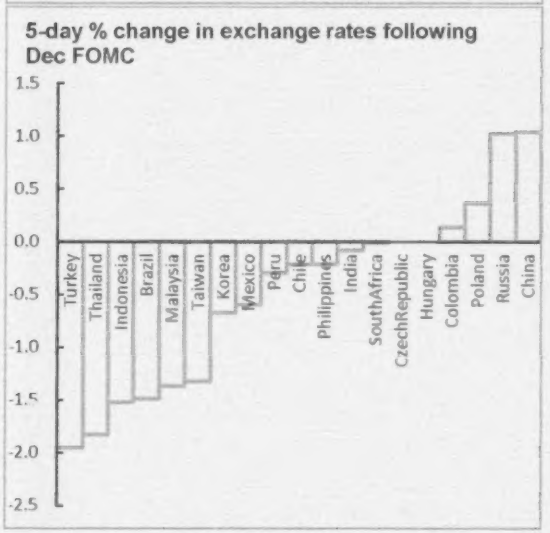
Sources: Bloomberg, national sources via Haver Analytics (for stock market indexes), and author's calculations

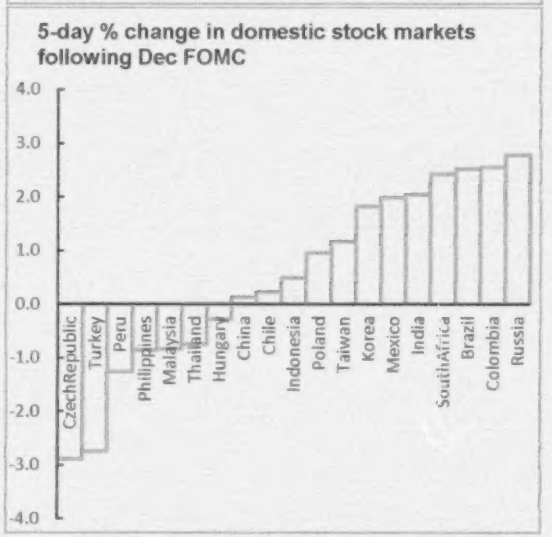
Chart 6: ...continued

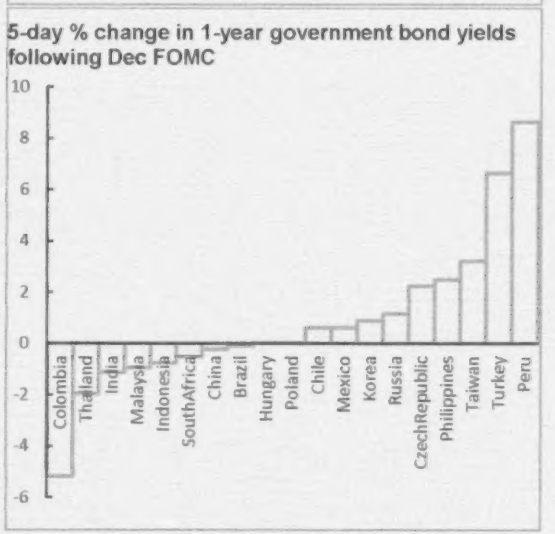












Note: Bars represent percentage change in the underlying variable between market close the day before the event in question and market close on the fifth weekday after the day of the event. Red numbers are extreme values that cannot clearly fit onto the chart on the same axis and remain readable.
Sources: Bloomberg, national sources via Haver Analytics (for stock market indexes), and author's calculations

Tables

Table 1: Estimated impact of tapering announcements on exchange rates

	Tapering dummies								Control variables					
	May 22 - testimony		June 19 - FOMC		September 18 ("non-taper")		Dec. 18 (actual taper)		Global stock returns		Global bond returns		Observations	R-squared
Brazil	-0.003**	(-2.94)	-0.019***	(-22.21)	0.029***	(24.83)	-0.003*	(-2.42)	0.107	(1.00)	0.593***	(3.77)	204	0.180
Chile	-0.005***	(-7.75)	-0.010***	(-18.52)	0.014***	(18.12)	-0.001	(-1.41)	0.121	(1.74)	0.461***	(4.40)	215	0.209
China	-0.002***	(-4.20)	0.006***	(13.60)	0.004***	(5.29)	-0.002**	(-2.94)	0.144**	(2.97)	0.483***	(3.91)	215	0.254
Colombia	-0.004***	(-4.13)	-0.006***	(-7.44)	0.005***	(5.96)	-0.005***	(-6.20)	0.189*	(2.10)	0.899***	(8.29)	215	0.260
Czech Republic	0.001***	(7.68)	0.000*	(1.99)	-0.000*	(-2.09)	-0.001***	(-7.15)	0.011	(1.20)	0.006	(0.41)	215	0.018
Hungary	-0.000	(-0.62)	-0.017***	(-27.83)	0.014***	(16.98)	-0.009***	(-10.99)	0.256***	(3.73)	0.904***	(7.34)	215	0.319
India	0.001	(0.55)	0.000	(0.49)	-0.011***	(-8.68)	-0.007***	(-5.52)	0.325**	(2.75)	0.567***	(3.67)	202	0.143
Indonesia	0.002	(1.72)	-0.017***	(-19.35)	0.035***	(23.93)	-0.005***	(-5.91)	0.137	(1.72)	0.293	(1.04)	215	0.175
Korea	-0.004***	(-10.69)	-0.003***	(-9.10)	0.002***	(3.86)	-0.000	(-0.99)	0.168***	(4.06)	0.442***	(5.42)	215	0.268
Malaysia	-0.001**	(-2.82)	-0.007***	(-18.16)	0.017***	(29.99)	0.003***	(5.05)	0.162**	(3.22)	0.448***	(5.35)	215	0.292
Mexico	-0.004***	(-4.54)	-0.025***	(-32.49)	0.015***	(15.73)	0.002*	(2.47)	0.328***	(3.71)	0.548***	(4.19)	215	0.298
Peru	-0.009***	(-14.00)	-0.001*	(-2.33)	0.003***	(4.60)	-0.004***	(-8.73)	0.044	(0.98)	0.186	(1.43)	213	0.107
Philippines	0.001	(1.53)	-0.001***	(-4.08)	0.002***	(3.48)	-0.004***	(-7.23)	0.182***	(4.05)	0.180*	(2.33)	215	0.166
Poland	-0.002**	(-3.16)	-0.010***	(-19.66)	0.019***	(24.15)	-0.005***	(-6.48)	0.213***	(3.38)	0.989***	(10.23)	215	0.373
Russia	-0.003***	(-3.38)	-0.013***	(-17.89)	0.012***	(14.04)	0.001	(0.73)	0.227*	(2.56)	0.522***	(6.17)	215	0.296
South Africa	0.001	(1.02)	-0.016***	(-18.58)	0.018***	(13.45)	-0.003*	(-2.21)	0.243*	(2.41)	0.656***	(3.49)	215	0.163
Taiwan	-0.002***	(-5.49)	0.001***	(5.96)	-0.000	(-1.34)	-0.003***	(-8.57)	0.065*	(2.57)	0.354***	(6.71)	215	0.325
Thailand	-0.001***	(-3.74)	-0.003***	(-8.68)	0.011***	(21.33)	-0.008***	(-14.21)	0.094*	(1.99)	0.391***	(5.31)	215	0.257
Turkey	0.000	(0.43)	-0.006***	(-9.88)	0.023***	(29.65)	-0.011***	(-14.16)	0.162*	(2.31)	0.573***	(4.86)	215	0.275

Notes: Robust standard errors in parentheses. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. Statistically significant coefficients with the expected sign are shaded.

Table 2: Estimated impact of tapering announcements on stock market indexes

	Tapering dummies								Control variables					
	May 22 - testimony		June 19 - FOMC		September 18 ("non-taper")		Dec. 18 (actual taper)		Global stock returns		Global bond returns		Observations	R-squared
Brazil	0.008***	(6.33)	-0.027***	(-23.33)	0.022***	(12.24)	0.002	(1.24)	0.756***	(5.56)	-0.232	(-0.92)	195	0.199
Chile			-0.003***	(-3.60)			-0.005***	(-4.13)	0.398***	(3.97)	-0.038	(-0.15)	193	0.114
China	0.005***	(5.30)	-0.004***	(-4.62)	-0.003*	(-2.20)	-0.012***	(-10.67)	0.438***	(4.96)	0.249	(1.15)	189	0.164
Colombia	0.007***	(7.24)	-0.030***	(-7.93)	-0.006***	(-4.06)	0.005***	(4.41)	0.655***	(7.25)	-0.263	(-1.34)	195	0.271
Czech Republic	0.004**	(2.77)	-0.033***	(-5.38)			-0.004*	(-2.09)	0.490**	(3.03)	-0.179	(-0.57)	192	0.096
Hungary	0.019***	(17.59)	-0.020***	(-4.83)	-0.001	(-0.60)	-0.006***	(-4.67)	0.543***	(4.98)	-0.462*	(-2.11)	192	0.166
India	0.001	(0.71)	-0.027***	(-5.49)	0.029***	(16.36)	0.005**	(2.69)	0.683***	(4.59)	-0.219	(-0.89)	191	0.258
Indonesia	0.006***	(4.15)	-0.039***	(-6.73)	0.042***	(17.37)	-0.004	(-1.92)	0.594***	(3.73)	-0.284	(-0.90)	187	0.200
Korea	0.010***	(9.09)	-0.016***	(-3.61)			-0.001	(-1.31)	0.532***	(6.14)	0.056	(0.25)	192	0.199
Malaysia	-0.002**	(-3.29)	-0.009***	(-4.00)	0.012***	(13.46)	-0.004***	(-5.27)	0.171**	(3.04)	-0.194	(-1.65)	189	0.094
Mexico	-0.007***	(-3.75)	-0.007***	(-4.58)	0.012***	(5.94)	0.001	(0.44)	0.603***	(3.40)	0.238	(0.73)	197	0.192
Peru	0.005**	(3.30)	-0.004**	(-3.18)	-0.009***	(-4.16)	-0.005**	(-3.32)	0.529***	(3.92)	0.631	(1.70)	198	0.122
Philippines	0.009***	(7.29)	-0.033***	(-6.54)	0.025***	(10.84)	-0.002	(-0.83)	0.578***	(3.89)	-0.405	(-1.46)	187	0.131
Poland	0.006***	(5.23)	-0.034***	(-7.24)	0.012***	(8.14)	-0.003*	(-2.12)	0.617***	(6.46)	0.079	(0.32)	189	0.259
Russia	0.024***	(13.15)	-0.041***	(-6.31)	0.030***	(12.49)	-0.002	(-1.00)	0.827***	(4.49)	-0.484	(-1.51)	196	0.300
South Africa	0.004***	(3.89)	-0.030***	(-7.27)	0.016***	(10.76)	-0.007***	(-5.53)	0.764***	(7.15)	-0.227	(-1.03)	194	0.353
Taiwan	0.004***	(4.30)	-0.012***	(-3.60)			-0.006***	(-5.42)	0.424***	(5.04)	-0.032	(-0.18)	191	0.158
Thailand	-0.005**	(-3.15)	-0.027***	(-4.25)	0.031***	(11.56)	0.003	(1.78)	0.556**	(3.27)	-0.287	(-0.85)	193	0.140
Turkey	0.030***	(15.81)	-0.052***	(-7.92)	0.054***	(21.22)	-0.000	(-0.09)	0.810***	(4.23)	0.585	(1.70)	200	0.258

Notes: Robust standard errors in parentheses. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. Statistically significant coefficients with the expected sign are shaded.

Table 3: Estimated impact of tapering announcements on 10-year bond yields

	Tapering dummies								Control variables					
	May 22 - testimony		June 19 - FOMC		September 18 ("non-taper")		Dec. 18 (actual taper)		Global stock returns		Global bond returns		Observations	R-squared
Brazil	0.013	(0.77)	0.336***	(23.39)	-0.337***	(-15.54)	-0.006	(-0.32)	0.865	(0.54)	-15.552***	(-4.46)	204	0.173
Chile			-0.005	(-0.68)	0.011	(1.66)	0.001	(0.19)	-0.601	(-1.10)	-1.942*	(-2.14)	201	0.008
China	-0.066***	(-4.71)	-0.106***	(-7.80)	0.129***	(7.57)	0.066***	(3.78)	-6.465***	(-3.93)	-10.519***	(-3.87)	215	0.235
Colombia	-0.043***	(-8.32)	0.082***	(4.23)	-0.059***	(-7.05)	0.049***	(5.74)	-0.446	(-0.65)	-3.389**	(-3.27)	213	0.121
Czech Republic	0.003	(0.70)	0.029*	(2.07)	-0.012*	(-2.00)	0.030***	(5.90)	-0.734	(-1.51)	-0.533	(-0.82)	215	0.054
Hungary	0.011	(1.22)	0.239***	(7.14)	-0.074***	(-6.12)	0.043***	(4.28)	-3.599***	(-4.08)	-2.191	(-1.21)	215	0.161
India	0.055***	(3.41)	0.175**	(3.04)	-0.253***	(-14.78)	-0.040**	(-3.18)	-0.498	(-0.43)	3.376	(1.24)	202	0.051
Indonesia	0.054***	(4.95)	0.076*	(1.99)	-0.202***	(-14.56)	-0.004	(-0.36)	-3.286**	(-3.26)	-1.866	(-0.95)	215	0.081
Korea	-0.011*	(-2.32)	0.080***	(4.74)	0.185***	(23.42)	0.031***	(4.97)	-1.611**	(-3.07)	-4.651***	(-5.35)	215	0.300
Malaysia	0.003	(1.40)	0.003	(0.32)	-0.051***	(-14.78)	0.010**	(3.16)	-0.214	(-0.81)	-0.097	(-0.23)	215	0.035
Mexico	-0.020*	(-2.07)	0.105***	(10.97)	0.012	(0.95)	-0.002	(-0.13)	-2.209	(-1.85)	-0.704	(-0.46)	215	0.058
Peru	-0.005	(-0.47)	0.013	(1.42)	0.039**	(2.66)	0.054***	(4.41)	-3.730***	(-3.95)	-8.510***	(-3.77)	211	0.166
Philippines	-0.021*	(-2.07)	0.304***	(7.35)	-0.057***	(-3.42)	0.216***	(18.98)	-0.492	(-0.54)	-0.444	(-0.21)	215	0.088
Poland	-0.071***	(-12.75)	0.248***	(12.96)	-0.059***	(-6.59)	-0.039***	(-4.45)	-0.295	(-0.41)	-5.122***	(-5.06)	215	0.276
Russia	0.052***	(11.99)	0.211***	(12.47)	0.014*	(2.03)	0.012*	(2.13)	-1.262**	(-2.65)	-0.987	(-1.06)	215	0.173
South Africa	-0.108***	(-10.51)	0.175***	(4.74)	-0.182***	(-13.73)	0.050***	(4.66)	-1.197	(-1.19)	-8.995***	(-4.64)	215	0.223
Taiwan	-0.005	(-1.94)	-0.007	(-0.73)	0.029***	(9.14)	-0.019***	(-8.62)	-0.308	(-1.62)	-1.203*	(-2.53)	215	0.088
Thailand	0.024***	(6.55)	0.088***	(5.99)	-0.133***	(-25.37)	0.005	(1.08)	-0.790	(-1.86)	-0.822	(-0.98)	215	0.121
Turkey	-0.118***	(-5.01)	0.513***	(6.43)	-0.642***	(-18.19)	0.038	(1.36)	-3.172	(-1.23)	-7.596	(-1.95)	215	0.242

Notes: Robust standard errors in parentheses. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. Statistically significant coefficients with the expected sign are shaded.

Table 4: Estimated impact of tapering announcements on portfolio flows (weekly)

	Tapering dummies*								Control variables					
	May 22 - testimony		June 19 - FOMC		September 18 ("non-taper")		Dec. 18 (actual taper)		Global stock returns		Global bond returns		Observations	R-squared
Brazil	-0.203***	(-4.23)	-0.00804	(-0.09)	-0.404***	(-4.32)	-0.409***	(-9.87)	7.090*	(2.46)	-0.583	(-0.15)	220	0.065
Chile	-0.182***	(-4.65)	0.117	(0.70)	-0.830***	(-29.09)	-0.188***	(-3.83)	2.748*	(2.44)	-3.796	(-0.76)	220	0.036
China	-0.128*	(-2.35)	0.311*	(2.13)	-0.159	(-1.67)	-0.233***	(-4.67)	3.424**	(2.62)	7.719	(1.42)	220	0.023
Colombia	0.0332	(0.82)	0.0659	(0.38)	-0.894***	(-32.48)	-1.149***	(-22.54)	2.339*	(2.05)	-4.428	(-0.87)	220	0.051
Czech Republic	0.0465	(1.42)	0.148*	(2.01)	-0.0730	(-1.13)	-0.215***	(-7.55)	3.604	(1.86)	1.401	(0.48)	220	0.041
Hungary	0.0548	(1.35)	0.118	(0.70)	0.124***	(3.68)	-0.459***	(-9.21)	3.218*	(2.58)	-2.487	(-0.49)	220	0.030
India	-0.0165	(-0.36)	0.110	(1.60)	-0.252**	(-2.71)	-0.0508	(-1.34)	5.297	(1.87)	0.365	(0.10)	220	0.040
Indonesia	0.00137	(0.03)	-0.693***	(-3.54)	-0.0421	(-1.44)	-0.0308	(-0.55)	2.866*	(2.46)	-4.992	(-0.85)	220	0.028
Korea	-0.0793	(-1.52)	0.811***	(6.87)	0.142	(1.55)	1.319***	(26.05)	7.188**	(2.63)	-2.411	(-0.55)	220	0.075
Malaysia	-0.00936	(-0.21)	0.0467	(0.24)	0.0774*	(2.31)	-0.0652	(-1.16)	3.406*	(2.58)	-3.359	(-0.58)	220	0.026
Mexico	-0.132*	(-2.48)	-0.131	(-0.58)	-0.0464	(-1.42)	-0.410***	(-6.12)	3.751*	(2.48)	-4.493	(-0.67)	220	0.024
Peru	-0.00325	(-0.08)	0.429*	(2.53)	-0.0175	(-0.71)	-0.321***	(-6.41)	2.526*	(2.23)	-4.364	(-0.87)	220	0.026
Philippines	-0.132**	(-3.21)	0.133	(0.75)	-0.0738*	(-2.58)	-0.0192	(-0.37)	2.606*	(2.21)	-3.807	(-0.72)	220	0.020
Poland	-0.0877*	(-1.97)	0.170	(0.90)	-0.188***	(-5.86)	-0.676***	(-12.21)	3.336*	(2.44)	-3.510	(-0.63)	220	0.032
Russia	-0.100	(-1.66)	0.557*	(2.31)	0.150*	(2.56)	-0.797***	(-11.03)	5.844**	(2.79)	-3.732	(-0.51)	220	0.044
South Africa	-0.0249	(-0.52)	0.00974	(0.05)	-0.0250	(-0.58)	-0.323***	(-5.34)	4.465**	(3.00)	-4.075	(-0.65)	220	0.037
Taiwan	0.0346	(1.95)	0.335***	(6.34)	-0.160***	(-4.91)	-0.453***	(-25.67)	3.355***	(4.40)	-0.775	(-0.40)	220	0.120
Thailand	-0.138**	(-3.09)	0.632**	(3.23)	0.167***	(5.11)	-0.0717	(-1.27)	3.252*	(2.53)	-5.378	(-0.92)	220	0.034
Turkey	0.0630	(1.27)	1.095***	(5.25)	0.0442	(1.32)	-0.332***	(-5.41)	3.357*	(2.30)	-6.152	(-0.99)	220	0.041

Notes: Robust standard errors in parentheses. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. Statistically significant coefficients with the expected sign are shaded.

Table 5: Estimated impact of tapering announcements on dependent variable in country-level regressions, standardized by standard deviation

	Exchange Rates				Domestic Stock Markets				10-year Government Bond Yields				EPFR Portfolio Flows			
	May 22 - testimony	June 19 - FOMC	September 18 ("non-taper")	Dec. 18 (actual taper)	May 22 - testimony	June 19 - FOMC	September 18 ("non-taper")	Dec. 18 (actual taper)	May 22 - testimony	June 19 - FOMC	September 18 ("non-taper")	Dec. 18 (actual taper)	May 22 - testimony	June 19 - FOMC	September 18 ("non-taper")	Dec. 18 (actual taper)
Brazil	-0.345	-2.334	3.369	-0.416	0.555	-2.008	1.544	0.118	0.214	2.595	-2.610	-0.135	-0.641	-0.025	-1.276	-1.292
Chile	-0.726	-1.585	2.247	-0.106	0.000	-0.403	0.000	-0.630		0.035	0.103	-0.001	-0.353	0.227	-1.612	-0.365
China	-0.555	1.159	0.768	-0.286	0.607	-0.317	-0.252	-1.168	-0.495	-0.857	0.997	0.436	-0.678	1.648	-0.843	-1.235
Colombia	-0.458	-0.749	0.631	-0.623	0.628	-2.420	-0.532	0.507	-0.999	1.468	-1.119	1.102	0.220	0.437	-5.930	-7.621
Czech Rep.	0.644	0.196	-0.165	-0.672	0.307	-2.371	0.000	-0.377	0.159	1.312	-0.687	0.827	0.086	0.272	-0.134	-0.395
Hungary	-0.051	-1.648	1.292	-0.803	1.329	-1.393	-0.064	-0.410	0.114	2.075	-0.652	0.362	0.108	0.232	0.244	-0.904
India	0.036	0.008	-1.762	-1.122	0.000	-2.697	2.827	0.510	0.776	2.556	-3.864	-0.627	-0.109	0.724	-1.658	-0.334
Indonesia	0.367	-3.067	6.520	-0.839	0.548	-2.983	3.343	-0.319	0.555	0.749	-2.150	-0.135	0.002	-1.236	-0.075	-0.055
Korea	-0.808	-0.634	0.353	-0.009	0.820	-1.426	0.000	-0.075	-0.330	1.890	4.688	0.802	-0.146	1.497	0.262	2.435
Malaysia	-0.368	-1.713	3.814	0.727	-0.360	-1.660	2.038	-0.806	0.160	0.081	-2.767	0.603	-0.016	0.082	0.136	-0.115
Mexico	-0.464	-3.220	2.045	0.364	-0.696	-0.708	1.346	0.157	-0.363	1.747	0.309	0.045	-0.195	-0.193	-0.069	-0.605
Peru	-3.956	-0.473	1.430	-1.969	0.388	-0.333	-0.655	-0.405	-0.040	0.219	0.550	0.794	-0.006	0.808	-0.033	-0.605
Philippines	0.073	-0.493	0.509	-0.883	0.881	-3.038	2.272	-0.129	-0.168	2.627	-0.532	1.836	-0.253	0.255	-0.142	-0.037
Poland	-0.195	-1.004	1.854	-0.503	0.458	-3.329	1.199	-0.229	-1.623	5.263	-1.191	-0.788	-0.156	0.302	-0.334	-1.200
Russia	-0.434	-2.078	2.028	0.104	1.491	-2.401	1.794	-0.158	0.464	1.969	0.188	0.173	-0.138	0.770	0.207	-1.101
S. Africa	0.123	-1.713	1.882	-0.277	0.347	-3.197	1.715	-0.598	-1.507	2.147	-2.361	0.718	-0.040	0.016	-0.040	-0.518
Taiwan	-0.663	0.454	-0.162	-0.955	0.309	-1.350	0.000	-0.517	-0.191	-0.291	1.561	-1.147	0.053	0.515	-0.246	-0.697
Thailand	-0.561	-1.109	3.895	-2.542	-0.365	-2.276	2.756	0.226	0.645	2.218	-3.457	0.039	-0.237	1.084	0.286	-0.123
Turkey	0.035	-0.907	3.462	-1.777	1.979	-3.568	3.581	-0.107	-1.109	4.567	-5.787	0.458	0.099	1.727	0.070	-0.524

Table 6: Panel regression results for exchange rates

	Real GDP growth (annual)	Inflation (monthly, headline)	Productivity	Business confidence	Output gap	External debt (% GDP)	Current account	Chinn-Ito Index	GDP (annual US$)	CA (Q, US$)
May	-0.0055	-0.0047*	-0.0052	-0.0054	-0.0062	-0.0038	-0.0042	-0.0041	-0.0051	-0.0043
	(0.005)	(0.003)	(0.017)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
June	-0.0148***	-0.0085***	-0.0624***	-0.0154***	-0.0147***	-0.0081*	-0.0097***	-0.0105***	-0.0114***	-0.0101***
	(0.005)	(0.003)	(0.017)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Sept	0.0187***	0.0082***	0.0499***	0.0168***	0.0188***	0.0089**	0.0142***	0.0157***	0.0167***	0.0149***
	(0.005)	(0.003)	(0.015)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Dec	-0.0032	-0.0022	0.0053	-0.0015	-0.0013	-0.0005	-0.0019	-0.0020	-0.0026	-0.0021
	(0.005)	(0.003)	(0.013)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
May * S	0.0003	0.1643	0.0000	0.0030	-0.0003	-0.0000	0.0001	-0.0014	0.0006	0.0000
	(0.001)	(0.492)	(0.000)	(0.003)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
June * S	0.0012**	-0.9022*	0.0004***	0.0092***	-0.0006	-0.0001	0.0005*	-0.0016*	0.0008**	0.0001**
	(0.001)	(0.502)	(0.000)	(0.003)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Sept * S	-0.0010*	2.1511***	-0.0003**	-0.0024	0.0010	0.0002*	-0.0010***	0.0004	-0.0015***	-0.0001***
	(0.001)	(0.657)	(0.000)	(0.004)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Dec * S	0.0003	0.0223	-0.0001	-0.0037	0.0013	-0.0000	0.0002	-0.0001	0.0004	0.0000
	(0.001)	(0.361)	(0.000)	(0.004)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
S	.	0.0133	-0.0000	-0.0047*	0.0008	-0.0001	0.0001	-0.0000	-0.0002	0.0000
	.	(0.040)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	4,037	4,249	3,350	2,360	1,575	3,599	4,249	4,024	4,037	4,249
R^2	0.062	0.062	0.074	0.067	0.077	0.063	0.062	0.062	0.062	0.064
Groups	19	19	15	11	7	17	19	18	19	19

Notes: Panel-corrected standard errors in parentheses, adjusted for country-specific first-order correlation. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. "S" indicates the variable in each column.

The variables "May," "June," "Sept," and "Dec" are, respectively, dummy variables corresponding to the dates for Bernanke's May 22 testimony, and the June, September, and December FOMC statements, adjusted for time zone differences where required.

Table 7: Panel regression results for stock market returns

	Real GDP growth (annual)	Inflation (monthly, headline)	Productivity	Business confidence	Output gap	External debt (% GDP)	Current account	Chinn-Ito Index	GDP (annual US$)	CA (Q, US$)
May	0.0086	0.0020	-0.0248	0.0097	0.0011	0.0010	0.0044	0.0039	0.0042	0.0040
	(0.006)	(0.006)	(0.024)	(0.007)	(0.007)	(0.009)	(0.006)	(0.006)	(0.006)	(0.006)
June	-0.0252***	-0.0247***	-0.0244***	-0.0296***	-0.0263***	-0.0250***	-0.0257***	-0.0258***	-0.0244***	-0.0248***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sept	0.0235***	0.0234***	0.0222***	0.0243***	0.0198***	0.0247***	0.0228***	0.0229***	0.0224***	0.0224***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)
Dec	0.0049	0.0013	0.0028	0.0065	0.0045	0.0019	0.0035	0.0039	0.0033	0.0037
	(0.006)	(0.006)	(0.018)	(0.007)	(0.006)	(0.009)	(0.006)	(0.006)	(0.006)	(0.006)
May * S	-0.0012	0.9160	0.0002	-0.0052	-0.0042**	0.0001	0.0002	0.0018	-0.0001	0.0000
	(0.001)	(1.113)	(0.000)	(0.006)	(0.002)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)
June * S	0.0007	0.1925	0.0000	-0.0002	0.0016	0.0001	-0.0013*	0.0024	-0.0010	-0.0001
	(0.001)	(1.321)	(0.000)	(0.008)	(0.002)	(0.000)	(0.001)	(0.002)	(0.002)	(0.000)
Sept * S	-0.0011	-1.1889	-0.0000	-0.0002	0.0014	-0.0001	0.0003	-0.0028	-0.0001	-0.0000
	(0.001)	(1.467)	(0.000)	(0.008)	(0.002)	(0.000)	(0.001)	(0.002)	(0.002)	(0.000)
Dec * S	-0.0004	0.7306	0.0000	-0.0017	0.0002	0.0001	-0.0002	-0.0000	0.0002	-0.0000
	(0.001)	(0.574)	(0.000)	(0.010)	(0.002)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)
S	0.0006	-0.0421	-0.0000	-0.0019	0.0007	-0.0002	0.0004**	-0.0005	-0.0047	-0.0001
	(0.001)	(0.088)	(0.000)	(0.006)	(0.001)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)
N	3,669	3,837	3,032	2,136	1,424	3,277	3,837	3,636	3,669	3,837
R^2	0.051	0.049	0.047	0.059	0.052	0.054	0.050	0.049	0.050	0.049
Groups	19	19	15	11	7	17	19	18	19	19

Notes: Panel-corrected standard errors in parentheses, adjusted for first-order correlation specific to each country. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. "S" indicates the variable in each column.

The variables "May," "June," "Sept," and "Dec," are, respectively, dummy variables corresponding to the dates for Bernanke's May 22 testimony, and the June, September, and December FOMC statements, adjusted for time zone differences where required.

Table 8: Panel regression results for 10-year zero-coupon government bond yields

	Real GDP growth (annual)	Inflation (monthly, headline)	Productivity	Business confidence	Output gap	Current account	External debt (% GDP)	Chinn-Ito Index	GDP (annual US$)	CA (Q, US$)
May	-0.0244	-0.0029	-0.0310	0.0064	-0.0540	-0.0023	0.0684	-0.0042	-0.0096	-0.0034
	(0.047)	(0.031)	(0.177)	(0.042)	(0.043)	(0.030)	(0.060)	(0.033)	(0.038)	(0.032)
June	0.1800***	0.1729***	0.2132***	0.2377***	0.2347***	0.1796***	0.1789***	0.1812***	0.1681***	0.1705***
	(0.025)	(0.025)	(0.027)	(0.033)	(0.037)	(0.024)	(0.025)	(0.026)	(0.025)	(0.024)
Sept	-0.1222***	-0.1163***	-0.1146***	-0.1513***	-0.1298***	-0.1178***	-0.1223***	-0.1226***	-0.1122***	-0.1133***
	(0.025)	(0.024)	(0.027)	(0.033)	(0.038)	(0.024)	(0.025)	(0.026)	(0.025)	(0.025)
Dec	-0.0069	0.0101	0.0776	0.0461	-0.0158	0.0073	0.0332	0.0084	0.0078	0.0066
	(0.047)	(0.038)	(0.130)	(0.041)	(0.038)	(0.029)	(0.060)	(0.032)	(0.036)	(0.031)
May * S	0.0055	0.0079	0.0001	-0.0273	-0.0149	0.0031	-0.0023*	0.0029	0.0046	0.0001
	(0.007)	(6.068)	(0.001)	(0.037)	(0.014)	(0.005)	(0.001)	(0.013)	(0.006)	(0.000)
June * S	-0.0101**	-4.3842	-0.0003	-0.0140	-0.0014	0.0118**	-0.0013*	-0.0184	-0.0003	0.0002
	(0.005)	(7.760)	(0.000)	(0.039)	(0.018)	(0.005)	(0.001)	(0.014)	(0.007)	(0.000)
Sept * S	0.0072	3.7459	-0.0001	-0.0507	0.0245	-0.0054	0.0002	0.0096	-0.0079	0.0000
	(0.005)	(8.189)	(0.000)	(0.042)	(0.018)	(0.005)	(0.001)	(0.014)	(0.007)	(0.000)
Dec * S	0.0036	-1.2951	-0.0005	-0.0393	-0.0076	0.0026	-0.0008	-0.0023	-0.0016	0.0001
	(0.007)	(5.199)	(0.001)	(0.082)	(0.015)	(0.004)	(0.001)	(0.013)	(0.006)	(0.000)
S	-0.0027	0.5562	-0.0001	0.0199	-0.0001	-0.0013	0.0006	0.0021	-0.0080	-0.0001
	(0.005)	(0.591)	(0.000)	(0.036)	(0.006)	(0.001)	(0.002)	(0.003)	(0.008)	(0.000)
N	4,019	4,211	3,317	2,350	1,551	4,211	3,582	3,987	4,211	4,211
R^2	0.039	0.035	0.049	0.063	0.058	0.037	0.039	0.036	0.035	0.035
Groups	19	19	15	11	7	19	17	18	19	19

Notes: Panel-corrected standard errors in parentheses, adjusted for first-order correlation specific to each country. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. "S" indicates the variable in each column.

The variables "May," "June," "Sept," and "Dec" are, respectively, dummy variables corresponding to the dates for Bernanke's May 22 testimony, and the June, September, and December FOMC statements, adjusted for time zone differences where required.

Table 9: Panel regression results for EPFR weekly portfolio flows

	Real GDP growth (annual)	Inflation (monthly, headline)	Productivity	Business confidence	Output gap	External debt (% GDP)	Current Account	Chinn-Ito Index	GDP (annual US$)	CA (annual, US$)
May	-0.1832	-0.1699	-0.2180	-0.2708	-0.2266	-0.2286	-0.2139	-0.2082	-0.2379	-0.2180
	(0.601)	(0.565)	(0.510)	(0.751)	(0.737)	(0.310)	(0.578)	(0.358)	(0.671)	(0.588)
June	-1.3306**	-1.2628**	-2.5473***	-1.8149**	-1.7734**	-0.5230*	-1.3353**	-1.3512***	-1.5936**	-1.3802**
	(0.601)	(0.552)	(0.510)	(0.754)	(0.737)	(0.310)	(0.578)	(0.358)	(0.671)	(0.588)
Sept	0.0613	0.1450	-0.3617	0.1804	-0.0367	0.3132	0.1565	0.2136	0.1495	0.1429
	(0.601)	(0.477)	(0.563)	(0.773)	(0.737)	(0.310)	(0.578)	(0.358)	(0.671)	(0.588)
Dec	-0.4399	-0.3125	-0.0143	-0.6348	-0.3159	0.0221	-0.2662	-0.2184	-0.3033	-0.2792
	(0.601)	(0.586)	(0.550)	(0.763)	(0.737)	(0.310)	(0.578)	(0.358)	0.0000	(0.588)
May * S	-0.0082	-0.0508	-0.0000	0.0005	-0.0335	-0.0003	0.0053	0.0118	(0.000)	0.0005
	(0.015)	(0.162)	(0.004)	(0.002)	(0.042)	(0.010)	(0.016)	(0.052)	0.0002***	(0.001)
June * S	-0.0077	-0.4020***	0.0082**	0.0071***	-0.1446***	-0.0258**	0.0585***	-0.1430***	(0.000)	0.0035***
	(0.015)	(0.145)	(0.004)	(0.002)	(0.042)	(0.010)	(0.016)	(0.052)	-0.0000	(0.001)
Sept * S	0.0240	-0.0350	0.0040*	0.0010	-0.0563	-0.0050	0.0183	-0.0834	(0.000)	0.0009
	(0.015)	(0.388)	(0.002)	(0.003)	(0.042)	(0.010)	(0.016)	(0.052)	0.0000	(0.001)
Dec * S	0.0452***	0.1344	-0.0023	0.0085***	-0.0055	-0.0086	0.0186	-0.0887*	(0.000)	0.0007
	(0.015)	(0.142)	(0.003)	(0.003)	(0.042)	(0.010)	(0.016)	(0.052)	0.0000	(0.001)
S	0.0121	0.1320*	0.0020	0.0012	-0.0129	-0.0005	-0.0005	-0.0061	(0.000)	0.0003
	(0.020)	(0.073)	(0.009)	(0.002)	(0.111)	(0.009)	(0.027)	(0.037)	0.0000	(0.000)
N	1,140	1,216	945	686	420	1,037	1,140	4,014	1,140	1,140
R^2	0.065	0.069	0.070	0.069	0.071	0.069	0.066	0.040	0.068	0.065
Groups	19	19	15	11	7	17	19	18	19	19

Notes: Panel-corrected standard errors in parentheses, adjusted for first-order correlation specific to each country. *** indicates p<0.01, ** indicates p<0.05, * indicates p<0.1. "S" indicates the variable in each column.

The variables "May," "June," "Sept," and "Dec" are, respectively, dummy variables corresponding to the weeks in which Bernanke's May 22 testimony, and the June, September, and December FOMC statements occurred, adjusted for time zone differences where required.

Table 10: Cross-section regression of the cumulative change in exchange rates on macroeconomic fundamentals

	CA (% GDP, Annual)	External debt (% GDP)	Inflation (monthly, headline)	Real GDP growth (annual)	Business confidence	Productivity	Output gap	Chinn-Ito Index	GDP (annual US$)	Current account
Chinn-Ito Index	1.9345** (0.810)	1.7501*** (0.560)	1.6566* (0.835)	1.6566* (0.875)	2.5055** (1.024)	1.8994** (0.779)	2.3986 (2.581)	1.8742** (0.852)	2.2076** (0.804)	2.0359*** (0.642)
Column variable	0.6102** (0.231)	0.2172*** (0.054)	-7.2330* (4.0836)	-0.2017 (0.543)	2.1705 (4.179)	0.1004 (0.072)	0.1397 (1.236)	. .	0.7609 (0.607)	0.0541*** (0.011)
Constant	-5.7080*** (1.096)	-14.7477*** (2.433)	-4.9890*** (1.138)	-5.8216** (2.588)	-6.6390*** (1.934)	-18.9508* (9.038)	-5.6094 (3.788)	-6.6379*** (1.254)	-7.6096*** (1.334)	-6.7848*** (0.910)
Number of countries	18	16	18	18	11	14	7	18	18	18
R-squared adj.	0.287	0.525	0.195	0.107	0.138	0.283	-0.178	0.156	0.169	0.490

Note: The dependent variable is the cumulative change in exchange rates from May 21, 2014 to August 31, 2014.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A-1: Abnormal return results, impact on exchange rates

	22-May-13		19-Jun-13		18-Sep-13		18-Dec-13	
	Cumulative Abnormal Return	**P-Value**	**Cumulative Abnormal Return**	**P-Value**	**Cumulative Abnormal Return**	**P-Value**	**Cumulative Abnormal Return**	**P-Value**
Brazil	-0.063	0.032	-0.055	0.054	0.002	0.483	0.053	0.059
Chile	-0.063	0.009	-0.007	0.366	-0.007	0.382	0.045	0.025
China	-0.039	0.075	0.007	0.394	-0.004	0.439	0.032	0.109
Colombia	0.024	0.167	-0.026	0.168	0.009	0.387	0.023	0.193
Czech Republic	-0.003	0.27	-0.008	0.033	-0.001	0.425	0.004	0.141
Hungary	0.001	0.485	-0.002	0.475	-0.007	0.42	0.049	0.074
India	-0.032	0.065	-0.01	0.29	0.107	0	-0.02	0.187
Indonesia	0.001	0.483	0.004	0.429	-0.016	0.215	-0.011	0.312
Korea	-0.016	0.274	0.002	0.473	-0.006	0.412	-0.007	0.407
Malaysia	-0.05	0.001	-0.029	0.021	0.004	0.377	-0.025	0.038
Mexico	-0.085	0.001	-0.011	0.32	-0.032	0.113	0.02	0.214
Peru	-0.03	0.008	-0.007	0.276	0.011	0.136	0.013	0.114
Philippines	-0.033	0.021	-0.023	0.065	0.025	0.037	-0.015	0.161
Poland	-0.002	0.466	-0.029	0.178	-0.019	0.314	0.032	0.171
Russia	-0.002	0.467	0.016	0.255	0.007	0.352	0.031	0.054
South Africa	-0.068	0.035	-0.002	0.477	-0.013	0.352	0.017	0.294
Taiwan	-0.006	0.241	-0.001	0.463	0.003	0.351	-0.014	0.071
Thailand	-0.064	0.001	-0.016	0.213	0.017	0.159	-0.017	0.163
Turkey	-0.016	0.257	-0.014	0.299	-0.02	0.259	-0.036	0.084

TableA-2: Abnormal return results, impact on stock markets

	22-May-13		19-Jun-13		18-Sep-13		18-Dec-13	
	Cumulative Abnormal Return	**P-Value**	**Cumulative Abnormal Return**	**P-Value**	**Cumulative Abnormal Return**	**P-Value**	**Cumulative Abnormal Return**	**P-Value**
Brazil	-0.039	0.217	-0.077	0.069	0.026	0.283	0.046	0.164
Chile	0.016	0.266	-0.021	0.193	0.052	0.047	-0.01	0.385
China	0.048	0.079	-0.025	0.235	-0.032	0.181	0.01	0.392
Colombia	0.018	0.357	-0.023	0.308	-0.06	0.101	-0.031	0.258
Czech Republic	0.023	0.371	-0.094	0.108	-0.012	0.433	0.02	0.368
Hungary	0.027	0.286	-0.041	0.2	0.059	0.119	-0.041	0.263
India	0.043	0.206	0.015	0.377	0.095	0.046	-0.064	0.093
Indonesia	-0.031	0.25	-0.042	0.217	0.001	0.49	-0.017	0.359
Korea	0.013	0.385	-0.031	0.234	-0.005	0.456	-0.031	0.233
Malaysia	-0.04	0.063	-0.029	0.135	0.012	0.315	0.011	0.339
Mexico	-0.016	0.311	0.016	0.304	-0.063	0.038	0.023	0.239
Peru	-0.028	0.274	0.007	0.443	0.005	0.458	0.028	0.286
Philippines	-0.05	0.135	-0.138	0.012	-0.002	0.483	-0.076	0.07
Poland	0.058	0.07	-0.03	0.205	-0.007	0.424	-0.085	0.018
Russia	-0.028	0.319	-0.037	0.273	0.058	0.172	-0.007	0.461
South Africa	0.056	0.075	-0.022	0.297	0.043	0.111	-0.006	0.44
Taiwan	-0.038	0.212	-0.078	0.036	0.009	0.422	0.009	0.426
Thailand	-0.035	0.236	-0.114	0.01	0.054	0.134	-0.095	0.031
Turkey	0.026	0.302	-0.054	0.145	0.044	0.204	-0.072	0.084

TableA-3: Abnormal return results, impact on 10-year bond yields

	22-May-13		19-Jun-13		18-Sep-13		18-Dec-13	
	Cumulative Abnormal Return	**P-Value**	**Cumulative Abnormal Return**	**P-Value**	**Cumulative Abnormal Return**	**P-Value**	**Cumulative Abnormal Return**	**P-Value**
Brazil	0.054	0.465	0.265	0.333	0.322	0.331	0.189	0.379
Chile	-0.545	0.136	0.179	0.254	-0.331	0.149	0.205	0.223
China	1.471	0.018	1.047	0.058	-0.65	0.168	-0.003	0.498
Colombia	0.017	0.466	0.098	0.319	0.141	0.247	0.432	0.029
Czech Republic	0.11	0.163	0.026	0.413	0.016	0.44	-0.059	0.296
Hungary	1.079	0.034	0.964	0.018	-0.437	0.134	-0.063	0.433
India	-0.513	0.035	0.185	0.238	-0.507	0.127	0.142	0.29
Indonesia	0.216	0.426	0.862	0.232	-0.332	0.386	0.417	0.358
Korea	0.222	0.139	0.108	0.273	0.335	0.068	-0.032	0.43
Malaysia	0.092	0.193	0.3	0.007	-0.18	0.06	0.265	0.015
Mexico	0.642	0.018	0.597	0.023	-0.166	0.27	0.027	0.466
Peru	1.226	0	0.424	0.068	-0.463	0.06	-0.118	0.388
Philippines	0.412	0.249	0.751	0.097	0.439	0.221	0.364	0.259
Poland	0.462	0.028	0.712	0.001	0.18	0.196	-0.097	0.281
Russia	0.552	0.162	0.35	0.259	-0.31	0.284	-0.074	0.445
South Africa	0.785	0.005	0.473	0.043	-0.582	0.035	-0.264	0.208
Taiwan	-0.021	0.396	0.063	0.218	0.074	0.217	0.032	0.346
Thailand	0.063	0.363	0.209	0.14	-0.315	0.068	-0.083	0.33
Turkey	0.833	0.065	1.179	0.017	-0.993	0.043	1.315	0.018

TableA-4: Abnormal return results, impact on portfolio flows

	22-May-13		19-Jun-13		18-Sep-13		18-Dec-13	
	Cumulative Abnormal Return	P-Value	Cumulative Abnormal Return	P-Value	Cumulative Abnormal Return	P-Value	Cumulative Abnormal Return	P-Value
Brazil	-0.942	0.594	-0.333	0.851	-0.05	0.977	-0.424	0.812
Chile	-4.778	0.000	-0.109	0.929	0.008	0.995	-0.151	0.902
China	-0.569	0.765	-0.258	0.892	0.173	0.927	-0.059	0.975
Colombia	-5.219	0.000	-0.26	0.834	-0.093	0.94	-0.305	0.808
Czech Republic	-0.312	0.789	-0.138	0.906	-0.11	0.926	-0.196	0.868
Hungary	-5.045	0.000	-0.294	0.815	-0.298	0.811	-0.247	0.844
India	-0.137	0.934	0.003	0.999	0.052	0.975	-0.192	0.908
Indonesia	-5.902	0.000	-0.199	0.88	-0.123	0.924	-0.119	0.927
Korea	-1.522	0.437	0.03	0.988	0.518	0.791	0.796	0.685
Malaysia	-5.912	0.000	-0.299	0.823	-0.031	0.982	-0.179	0.894
Mexico	-7.386	0.000	0.242	0.878	-0.437	0.779	-0.046	0.977
Peru	-4.953	0.000	-0.301	0.811	-0.236	0.848	-0.149	0.903
Philippines	-5.836	0.000	-0.377	0.757	-0.166	0.892	-0.177	0.89
Poland	-5.768	0.000	-0.213	0.874	-0.23	0.864	-0.311	0.818
Russia	-6.705	0.000	-0.182	0.924	-0.006	0.997	-0.282	0.883
South Africa	-6.2	0.000	-0.26	0.861	-0.264	0.862	-0.257	0.867
Taiwan	-0.029	0.986	0.465	0.774	-0.379	0.81	-0.218	0.889
Thailand	-5.513	0.000	-0.101	0.941	0.026	0.984	-0.365	0.792
Turkey	-6.566	0.000	-0.358	0.808	-0.122	0.934	-0.143	0.924

Appendix A: Abnormal return regressions

Abnormal return regression methodology

As a robustness check, we also include a test for whether or not the dependent variables we study observed abnormal returns in the days around Federal Reserve communications on tapering its monthly asset purchases. This is a commonly employed event-study method, very similar to that of Kozicki, Santor and Suchanek (2011).

This approach estimates the abnormal returns of financial variables as prediction errors from some benchmark model of normal returns in response to tapering. Event studies of this type typically proceed in three steps.

First, a model is used to calculate the *normal return* of a financial market variable over the event window, [19]i.e., the return that would be expected if the event did not take place. Equation (3) describes how the normal return, R_{it} (which takes the same form as the LHS of Equation (2)) is estimated:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}. \qquad (3)$$

We then follow two approaches to estimating the normal return, one where the explanatory variable, R_{mt} consists of only the variables in the vector X_{it} from Equation (2), and one where R_{mt} is equal to the mean return of R_{it} in the estimation window (the observations between 60 and 30 days prior to the event).[20]

The respective model is estimated over the estimation window and is then used to calculate the normal return $E[R_{it}|R_{mt}]$ over the event window.

Second, the abnormal return ε_{it}^{*} can be calculated for each EME variable and event date as the actual ex post return of the return R_{it} over the event window minus the normal return:

$$\varepsilon_{it}^{*} = R_{it} - E[R_{it}|X_{it}]. \qquad (4)$$

In a final step, we test whether the abnormal return on the dates of the events [or the cumulative abnormal return over the event window] is statistically significant. The null hypothesis for our analysis is that announcements related to tapering had no effect on EME asset returns.[21] A failure to reject the null hypothesis would suggest that there is no evidence that tapering announcements affected EMEs.

Abnormal return regression

Table A-1 reports that the cumulative abnormal return of **exchange rates** on tapering events was largely negative on May 22 and June 19. Abnormal returns are statistically significant in about 40 per cent of the cases, and are then always in the direction expected. It is also interesting to note that coefficients are now larger for the May 22 event, and in many cases larger than the impact on June 19. This contrasts with the

[19] The event window refers to the period over which the EME variables will be examined, e.g., the days preceding/following the announcement. We use an event window of 10 days before and after the announcement.

[20] Under the assumption that EME financial variables are jointly multivariate normal and independently and identically distributed through time, the model can be estimated using ordinary least squares. The length of the window is varied in our sensitivity analysis.

[21] H_0: $\varepsilon_{it}^{*}=0$, or $\sum_{eventdate-2}^{eventdate+2} \varepsilon_{it}^{*}=0$.

relatively small coefficients estimated in the dummy variable regression. One explanation is that the abnormal return regression captures the impact over a longer horizon (20 days). Thus, while the dummy variable regression did not pick up much impact on May 22, as markets possibly took longer to digest the unexpected announcement, the abnormal return regression does capture a slower reaction and shows that the impact on May 22 was sizable. Again, vulnerable and open countries are among the countries that felt the largest impact (i.e., Turkey, Brazil, Mexico, South Africa, etc.). Results are less clear for the September 18 event (the non-taper), where only abnormal returns for only two countries are positive and statistically significant (as expected). The impact on the actual taper is also ambiguous, potentially because the move was largely expected and did not affect markets to the same extent as the first mention of tapering.

Stock markets post negative abnormal returns on May 22, but they are largely statistically insignificant (Table A-2). Stock markets did not react to the actual announcement or the September event in a statistically significant way. Results are clearer for June 19 and the actual tapering announcement, where almost all countries saw a negative abnormal return, which is statistically significant for 9 countries.

Bond yields rose in almost all instances (Table A-3), on both dates where tapering was mentioned, and nearly half of the coefficients are statistically significant. Similar to the impact on exchange rates, the impact on the first mention of tapering (May 22) is now large and in many cases larger than on June 19, consistent with market observations. Bond yields receded on the non-taper event in the majority of countries, and almost in all cases where the estimated impact is statistically significant. On the actual announcement, bond yields increased again, but only for three cases in a statistically significant way.

For **portfolio flow** abnormal market return regressions (Table A-4), most abnormal returns carry the expected sign, i.e., portfolio flows turned negative on the first and second mention of tapering. Portfolio flows did not return to EMEs on the non-taper, but continued to decelerate, as well as on the actual announcement.

Robustness of the abnormal return regression

To ensure the robustness of our results, we use an alternative abnormal return regression, the *mean return model*, i.e., the return is regressed on its mean value rather than a market return. As the model is less restrictive, results are stronger and thus supportive of the market return regression results. All abnormal returns are statistically significant for all dependent variables but portfolio flows, and in most cases carry the expected sign:

EME **exchange rates** show a statistically significant and negative abnormal return on the first tapering date for 12 out of 19 countries. Even more so, for the second tapering event, all but four currencies depreciated in a statistically significant way, similar to results in section 4.3.1. And, as expected, with the exception of six currencies, abnormal returns are positive (appreciation) on the September (non-taper) date. Results are less clear for the actual tapering announcement, but as discussed above, markets likely had already incorporated

the news in anticipation, and thus the reaction on the actual announcement might be explained by other unrelated factors.[22]

As a second robustness check, we vary the length of the event window. While regressions using a shorter event window (3-day or 5-day) are generally in line with our findings, the shorter the event window, the fewer coefficients are statistically significant, in particular for the May 22 event. This is not surprising, given that markets might not have fully incorporated the news within three or five days of the respective announcements. In contrast, extending the event window to 20 days yields as many or more statistically significant abnormal returns, suggesting that EME financial markets reacted well beyond the initial days following announcements.

[22] As for stock markets, results from the mean return model are less clear. Only nine out of 19 cumulative abnormal returns are statistically significant for the May event, and 11 in the case of the June event. Stock markets continued to fall upon the September event for all but three countries, and fell for 13 countries on the December event (not shown). Bond yields increased for only 10 countries in a statistically significant way, but for all but two upon the June event. Results for September and December are more mixed. The mean return model for portfolio flows yields results very similar to the market return model: capital flows show a large and statistically significant reaction in response to the first event, and continued to fall following the subsequent events for most countries, although abnormal returns are not significant in the three latter events.

Appendix B: Data sources

Table B-1: Data sources for domestic stock market indexes

Brazil	*Financial Times*: Bovespa
Chile	*Financial Times*: IGPA General
Colombia	*Wall Street Journal*: IGBC
Czech Republic	*Financial Times*: PX50
China	Shanghai Stock Exchange: Shanghai-Shenzen-300
Hungary	*Financial Times*: Budapest Stock Exchange
India	WSJ/FT: Bombay Sensex
Indonesia	WSJ/FT: Jakarta Composite
Korea	WSJ/FT: Korea Composite
Malaysia	WSJ/FT: FTSE Bursa Malaysia KLCI
Mexico	*Wall Street Journal*: IPC
Peru	*Financial Times*: Lima General IGBVL
Philippines	WSJ/FT: Manila Composite
Poland	Warsaw Stock Exchange: WIG
Russia	Russian Trading System Stock Exchange: RTS
South Africa	*Financial Times*: FTSE/JSE All Share Index
Taiwan	WSJ/FT: Taiwan Stock Exchange Weighted Index
Thailand	WSJ/FT: Bangkok SET
Turkey	*Financial Times*: ISE National 100 Stock Price Index

[a]All stock market indexes via Haver Analytics

Table B-2: Data sources for country-specific macroeconomic variables

	Real GDP Growth (Annual)/GDP Level (annual USD)	Curr Acct Balance (Quarterly, USD/% of GDP)	Headline Inflation (Monthly, % chg.)	Business Confidence (monthly)	Labour Productivity (Output/worker, monthly)	Output Gap
Brazil	Brazilian Institute of Geography and Statistics	Banco Central do Brasil	Brazilian Institute of Geography and Statistics	Confederação Nacional da Indústria	Brazilian Institute of Geography and Statistics	
Chile	Banco Central de Chile	Banco Central de Chile	National Statistics (INE)		Banco Central de Chile	OECD
Colombia	National Administrative Department of Statistics (DANE)	Banco Central de Colombia	DANE			
Czech Republic	Czech Statistical Office	Czech Statistical Office	Czech Statistical Office			OECD
China	China National Bureau of Statistics	State Administration of Foreign Exchange	China National Bureau of Statistics			
Hungary	Central Statistical Office	National Bank of Hungary	Central Statistical Office	GKI Economic Research Co.	Central Statistical Office	OECD
India	Central Statistical Office of India	Reserve Bank of India	Haver Analytics			
Indonesia	Statistics Indonesia	Bank Indonesia	Statistics Indonesia			
Korea	Bank of Korea	National Statistics Office	National Statistics Office	Bank of Korea	National Stats. Office & Bank of Korea	OECD
Malaysia	Department of Statistics, Malaysia	Department of Statistics, Malaysia	Department of Statistics, Malaysia	Malaysian Institute of Economic Research	Department of Statistics, Malaysia	
Mexico	National Institute of Statistics and Geography	IMF	National Institute of Statistics and Geography		National Institute of Statistics and Geography	OECD
Peru	Central Reserve Bank of Peru	Central Reserve Bank of Peru	National Institute of Statistics and Informatics (INEI)		Central Reserve Bank of Peru	
Philippines	National Statistical Coordination Board	CB of the Philippines	National Statistics Office	Central Bank of the Philippines	National Stats. Coordination Board	
Poland	Central Statistical Office, Poland	National Bank of Poland	Central Statistical Office, Poland / National Bank of Poland		Central Statistical Office, Poland	OECD
Russia	Federal State Statistics Service	CB of Russia	Federal State Statistics Service			
South Africa	South African Reserve Bank	South African Reserve Bank	Statistics South Africa	Bureau of Economic Research, South Africa	South African Reserve Bank	
Taiwan	Directorate-General of Budget Accounting & Stats	Central Bank of China	Directorate-General of Budget Accounting & Stats		Directorate-General of Budget Accounting & Stats	
Thailand	National Economic and Social Development Board	Reserve Bank of India	Department of Internal Trade, Ministry of Commerce	Bank of Thailand	National Economic & Social Development Board & Stats Office	
Turkey	Turkish Statistical Institute	Turkish Statistical Institute	Turkish Statistical Institute	Central Bank of the Republic of Turkey	Turkish Statistical Institute	OECD

All data were retrieved using Haver Analytics. "External debt" (not shown in table) all from World Federation of Exchanges